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# Impact of urban expansion on arable land use at rural-urban fringe in Uyo municipality

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## Abstract

Hypothesis of whether or not urban development expansion caused the diminution of arable land use in the rural-urban fringe was tested for Uyo metropolis by inferential statistics with SPSS version 17 windows. Data for the hypothesis test were collected by questionnaire through quota sampling of 200 persons in 20 families in 10 communities in the rural-urban fringe around Uyo urban. A 1998 land use survey was compared. Urban expansion followed outward linear development along major transportation routes. Five land use types engulfed 90% of the fringe with land use sizes varying amongst them and between the land-contributing villages which were left with only 10% of the fringe area for agricultural and dwelling purposes. The land use size and growth rate were in decreasing order as: Transportation > Residence > Commercial > Institutional > Industrial land uses. Transportation leap-frogged in a decade at the highest growth rate of 4.788km<sup>2</sup>/year. Significant difference ( $p < 0.01$ ) and quadratic regression growth relationship marked 1998 - 2009 (a decade of) land use growth ( $R^2 = 98.6\%$ ,  $p = .05$ ). Urban expansion caused the diminution of agricultural land use in rural-urban fringe, and should be buffered against increasing food scarcity and urban poverty.

**Keywords:** Rural-urban fringe, Agricultural land, Urban growth, Land uses, Uyo metropolis

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## 1. Introduction

Rural-urban fringe is also known variously as the outskirts, the urban hinterland or suburb (Wikipedia, 2013), and is a transition zone with a mix of urban and rural land uses which often clash (Griffiths, 2010; Tutor 2u, 2011, Wikipedia; 2013). Functionally, it is forged from an interaction of urban and rural land uses, as a “country side in and around town or it is a multi-functional urban fringe (Countryside Agency and Groundwork UK, 2005; Wikipedia, 2013). Location- wise, it is the land at the edge of an urban area, where a huge mixture of land uses often exist (S-cool, 2013). Suburbanization takes place at the boundary of the rural-urban fringe following different urban expansion models or patterns (, 2007). At some point the fringe was largely a rural area where farming went on happily, and farmers were happy living in the rural-urban fringe with more farm land for agriculture using family or hired labour, and the area was pollution free (Answers.com, 2013). As population of the city expanded, the original urban area was no longer able to contain the upsurge in residential facilities, food and other economic needs; therefore, a state of want developed forcing the urban area to expand into the surrounding areas by some observable patterns (UK. answers.yahoo.com, 2003). These villages formed the rural-urban fringe.

The boundary population with the urban was seized by suburbanization pressure, as population grew with people who were not necessarily indigenes. The cost of living and lifestyle of the urban area started to catch up on those residing there. Firstly, the pressure of transportation development increased as the need for intercity communication and trades became inevitable. Then as more people turned into the capital for job search or such other opportunities for business or trade, dearth of residential accommodation seized the city centres (Akindelly, 2009). As such, more people came to the surrounding villages to reside because the rent for houses was relatively cheap for the non-standard accommodation. And in many cases shanty shelters were erected as stop-gaps.

Even Government located housing estates and institutions in the area. Private companies sited facility centres and factories there. Livelihood became harder than before; the working class residents depended on their income for their food and livelihood, but the landowners, with little or no land anymore, found livelihood more difficult with no agricultural production for subsistence under the pressure of economic forces operating in the area. This created obvious poverty in the midst of growing economic life at the fringe. Thus, the able bodied persons were also forced by push and pull factors to move from the countryside to the urban centres (i.e. rural-urban migration, RUM) because people tended to be pulled to the area of prosperity and pushed from the area of decline (Haan, 1999; Hossain, 2001; Braun, 2004; Yara, 2008). The farm could not support their continued livelihood in the fringe nor their family because they kept dividing the land, even as they had lost their jobs in agriculture.

Urban development had gone on for two decades (1987 to 2007) since state creation but marked development came in 1999. It is believed to take concentric and sectoral forms with linear development. Population have been concentrating in the rural-urban fringe along major interacting roads starting at the surroundings of transport terminals located at the suburbs by the government for private transportation businesses along the major intercity and urban ring roads (Figure 1).

With the state of landlessness, inactivity, little or no income round the year, the rural-urban fringe under the pressure of urban-development land use was no longer a haven at all for the villagers who once had farming as their mainstay/occupation. Therefore, some measures should be put in place to counter-balance the economic crunch on them or compensate for agricultural production lost by creating activity-based economic empowerment programmes for the rural dwellers in the rural-urban fringe. The situation in the rural-urban fringe surrounding Uyo urban area, about twenty years after it became the capital territory of Akwa Ibom State, was investigated.

The objectives of the study were to:

1. Carry out questionnaire survey on land uses in rural-urban fringe around Uyo.
2. Identify urban development land uses and quantify their effects on (or extent of diminution of) village agricultural land use in the fringe.
3. Qualify the effect of suburbanization of rural-urban fringe on arable agricultural production (land use) by a test of hypothesis.

## 2. Methodology

### 2.1. Study location and layout

The geographical location was Uyo Metropolis, the capital of Akwa Ibom State, lying within Latitudes  $5^{\circ}00'N$  to  $5^{\circ}04'N$  and Longitudes  $8^{\circ}47'E$  to  $7^{\circ}56'E$ . It occupies an area of 10km radius and has expanded far beyond its closely built up area into the surrounding rural-urban areas by suburbanization pressure. GIS ArcView software was used to produce the map of Uyo urban; and another map of Uyo was retrieved from Wikipedia (2013b). Land use maps of Uyo for the study period and Uyo urban Master plan Revised were obtained from Uyo Capital City Development Authority (UCCDA). Also, the State map was obtained from map depot, Cartography unit, Ministry of Land and Urban Planning, Uyo.

### 2.2. Data collection

Primary data used questionnaires with un-structured response to solicit information on land use. Quota sampling of land uses was applied – the main urban development land use was six types – Housing (Residential), Institutional (schools/universities, secretariat, stadia), industrial, commercial, transportation. The leftover was the undeveloped area (being original arable land in the villages used for agricultural, and agro-allied production).

#### 2.2.1. Land use sample data

Sample size, randomly selected, was 10 villages in the rural-urban fringe with 20 families from each village (simple stratified sampling) to include “Ete Idung” (Village Head); nine land owners, urban workers or

farmers and Farmers Association Staff, and inclusive of at least two women. This stratified sample was representative of the original dwellers and agricultural land users in the present fringe outskirts.

Secondary information data were the previous land use study report (1998) and the population census (1991 and 2006 census) from Nigerian National Population Commission (NPC, 2010).

### 2.3. Statistical analysis

The SPSS version 17 software windows was used for descriptive and inferential statistics of data. Non-parametric test was used for one-tailed analysis of variance (ANOVA) to determine the significant difference between land use distribution in 1998 and 2009 (i.e. a 10-year land use difference) to show any agricultural land engulfment by urban development land use (Ofo, 2000).

$$\text{Total land use area} = \sum_{i=1}^n (\text{land use area})_i.$$

where  $i$  = individual area of urban development land use,  $i = 1$  to  $n$

#### 2.3.1. Test of Hypothesis:

Hypotheses were proposed as follows:

**H<sub>0</sub>:** Urban development expansion does not diminish availability of arable (agricultural) land use in the rural – urban fringe

**H<sub>1</sub>:** Urban development expansion causes the diminution of agricultural land availability in the rural-urban fringe.

These were tested using ONE-WAY ANOVA

## 3. Results

### 3.1. The pattern of urban development expansion

Figure 1 shows the layout map of Uyo Urban development in the Central Business (CBD) and the constituting villages in the rural-urban fringe. The Urban development expansion was observed in many patterns following some known postulates. Before 2009, the parks (Figure 1) were at the verge of urban development limit but now are within urban area which has spread to the outer Ring Road in concentric zone and sectorial pattern. The outward expansion from the urban centre into the fringe penetrated in concentric and sectorial forms of irregular wedge shape at the Ring Road periphery (Figure 1).

Burgess et al (1925)( Bunyi, 2010) out that as a city grew, it expanded radially outwards from the urban centre to form a series of concentric zones while Homer Hoyt (1939) (Sanabaria, 2010; Wikipedia 2013c) added that the different land uses in the urban developed together near the core of the city central business



### 3.2. Questionnaire data analysis

Data obtained from questionnaires were collated and analyzed using statistical tools on SPSS version 17 software. The number of respondents were grouped according to various information solicited in the questionnaire.

Table 1 collates data on the urban development influence on agricultural land availability in the villages in the outskirts.

**Table 1.** Effect of urban development on village land at rural-urban fringe in 2009

Level of effect	Respondents (no.)	Proportion of Respondents, %
Loss was complete	88	44
Loss was moderate	72	36
Loss was slight	24	12
No. Land loss at all	16	8
Total	200	100

Table 2 shows data on respondents residing at the fringe but commuting to urban centre for work because they had lost their arable family land to suburbanization.

**Table 2.** Proportions of urban workers living in the rural-urban fringe to commute to work

Groups of urban workers	Respondents, Nos.	Proportion of sample
10 – 20	12	6.0
20 – 40	16	8.0
40 – 80	44	22.0
> 80	128	64.0
Total	200	100

The proportion of village land engulfed by the rippling-wave of urban development in rural-urban fringe is indicated in Table 3.

The urban development land uses which bore pressure against sustainability of agricultural land use in the rural-urban fringe, hence caused the diminution of available land space for arable agricultural production are shown in Table 4, and was compared to the land use status 10 years previously.

In Table 4, undeveloped area was the remnant of original rural land now left for agricultural land use. Ratio of 2009:1998 land use area. Ratio > 1 indicated if urban development pressure had engulfed



agricultural land at further remote areas of rural-urban fringe into suburbanization. The value of transportation ratio was astronomical.

**Table 3.** Proportions of village land engulfed by urban development in rural-urban fringe

Agricultural land engulfed %	No. of Respondents	Proportion of sample, %
10	16	8
20	28	14
30	36	12
40	54	18
50	52	26
>50	44	22
Total	200	100

**Table 4.** Types and sizes of land uses in sampled rural-urban fringe in 2009, compared to 1998

Land use type	1998 Area, km <sup>2</sup>	%	2009 Area, km <sup>2</sup>	%	Ratio
Residential	8.560	10.5	34	21.4	4.0
Institutional	2.900	5.6	20	12.6	7.0
Commercial	0.850	1.6	28	17.6	24.0
Industrial	0.540	1.0	13	8.2	33.0
Transportation	0.125	0.2	48	30.2	384.0
Undeveloped	38.900	75.1	16	10.0	0.4(<1)
Total	51.87	100	159	100	

The distribution of the sampled village land engulfed by urban development expansion in 2009 is shown in Table 5. A total of 159 ha of rural-urban fringe as the village land contribution was not evenly distributed but varied between the urban development land uses and amongst the villages (Table 5). The variation between urban development land uses ranged from  $C_v = 30.74$  to  $68.47\%$  with roads (transportation mode of urban development), being the least varied demand, while school was the most varied amongst land uses. The reason is that roads pass through such village land by compulsion [Government order] while schools vary in types, ownership and location, and are located where land is available and saleable. Also, the variation amongst villages ranged from  $C_v = 18.18\%$  for village No. 8 to  $69.28\%$  for village No.7 (Table 5).The demand for land by urban land uses in the rural-urban fringe was highly variable in size and type between land-contributing villages. Hence the portion of rural-urban fringe land left for agricultural land use varied highly ( $C_v = 54.84\%$ ), being the second most variable land use after schools (Table 5).

## 4. Discussion

### 4.1. The result of hypothesis test

The test of hypothesis was proved by a significant difference between the 1998 and the 2009 land use variables (Table 4). Using the ANOVA, the calculated F-ratio was significantly different from the table value at  $p = 0.01$ . This indicated that the mean of 2009 land use for different urban developments was significantly different from that of 1998 land use. Also, the proportion of undeveloped land (mean for agricultural land use) changed significantly in one decade (1998 – 2009). The agricultural land use depleted very fast at (-2.2 km<sup>2</sup>/yr.), the urban development land uses rapidly accelerated at different rates for different land uses (Table 6). Thus, the cumulative rate of urban land uses was about 5 times faster than the diminishing rate of undeveloped land. From the two rational above the true hypothesis was that urban development land use caused rapid diminution of agricultural land use in the rural-urban fringe around Uyo metropolis.

### 4.2. Influence of urban development on agricultural land in rural-urban fringe

The agricultural land (generally village land were agricultural land) in the rural-urban fringe (outskirt of Uyo Urban area) were affected by Uyo urban development expansion. All of the ten component villages surveyed had their original land engulfed to varying extents by the urban development land uses (Table 4). The categories or components of urban development land use are shown in Table 4.

The effect was interpreted as loss of land asset, resource or income to a competitively more beneficial land use. The effect varied from complete loss of owned land (hence, loss of mainstay economic resource) to no loss at all (Table 1). The worst affected were those with complete loss of agricultural land due to urban development expansion. These were 44% of the respondents, while no loss at all was only a meagre 8% of the respondents. The proportions of those losing land to urban development varied in groups of 10 to 80 in the communities, i.e. from few families to whole village land (Table 2). The loss of family land or whole village arable land led to efflux of job seekers to the urban centre to work or search for work while commuting from their dwellings in the villages in the rural-urban fringe.

Also, one component of urban development land use was residence. Some of the respondents (Table 2) showed that they had their residence in the fringe area but commuted to work in the urban area from there rather than residing in the city. Invariably, the urban development of rural-urban fringe engulfed much land area in the rural-urban transition (Table 3) so that people not only do not have arable agricultural land any longer but they now could only reside there and commute daily to town. The proportion of the fringe land engulfed by suburbanization varied from place to place (Table 5). The respondents in the various villages agreed that the proportions of village land engulfed by urban development pressure in the rural-urban fringe varied (Table 5).



### 4.3. Sectorial urban development land uses

The urban development land users were diverse. Our survey showed six of them taking up 159 ha of land in the rural-urban fringe at different proportions (Table 4). This diverse land use fusion created the outskirts around Uyo town as a multi-functional urban fringe (Wikipedia, 2013a; Countryside Agency and Groundwork UK, 2005). Their copious land use left only 16km<sup>2</sup> out of 159 km<sup>2</sup> (i.e. 10 percent) of the rural fringe land as undeveloped area i.e. as original village land that arable agricultural practice could go on. The 10 percent was too meagre compared with the 90% (or 143ha) consumed by urban development land users. The proportion of urban development land uses which displaced agricultural land in the rural-fringe land varied by type in magnitude (area of land used) in the order (by percentages) as follows: Transportation > (30.2) > Residential (21.4) > Commercial (19.6) > Institutional (12.6) > Industrial (8.2) (Table 4).

**Table 5.** Villages in rural-urban fringe and their land contribution to urban development land use

DVL	Road	School	Housing	Industry	Market	Undev. Total	Mean	Sd	Cv	
1	6	2	4	4	2	5	23	3.83	1.60	41.79
2	5		4			2	14	3.67	1.53	41.66
3	8	5	5	2	3	2	22	4.17	2.32	55.60
4	4	1	1		3	2	12	2.20	1.30	59.27
5	5	8	5	1	2		20	4.20	2.77	66.07
6	5	4	4	3	2		18	3.60	1.14	31.67
7	5		2		2	1	10	2.50	1.73	69.28
8	3		3	2	3		11	2.75	0.50	18.18
9	4		3		6	2	15	3.75	1.71	45.54
10	3		3	1	5	2	14	2.80	1.48	52.97
Total	48	20	34	13	28	16	159			
<b>Mean</b>	<b>4.80</b>	<b>4.00</b>	<b>3.40</b>	<b>2.17</b>	<b>3.11</b>	<b>2.29</b>				
<b>Sd</b>	<b>1.48</b>	<b>2.74</b>	<b>1.26</b>	<b>1.17</b>	<b>1.45</b>	<b>1.25</b>				
<b>Cv</b>	<b>30.74</b>	<b>68.47</b>	<b>37.20</b>	<b>53.96</b>	<b>46.70</b>	<b>54.84</b>				

NB: Unit of land use area = km<sup>2</sup>; Undev = undeveloped land used; Cv = %; DVL is contributor villages: 1, Aka Offot; 2, Anua Uyo; 3, Efiat Offot; 4, Eniong Offot; 5, Ewet; 6, Four Towns; 7, Idoro Uyo; 8 Itiam Etoi; 9 Nung Ukot Itam; 10 Oku Uyo

The 30.2% land use by transportation for urban development of the rural – urban fringe compared well with 32% of urban land for roads, highway rail while the 12.6% for institution was comparable to the 10.0% for institutions in urban land use (3a\_landuse, 2013). The leading by transportation was seen as satisfying the transportation principle of colonization model of urban expansion suggested by Taeffe et al (1963). On this principle, it was found out that urban areas tended to spread, by linear development along major access routes (Geocase, 2007) such as roads, railways and now airport roads; hence urban spread by colonizing process around limited access routes in different directions (Taeffe et al, 1963). Uyo urban is fed in all directions by new and/or rehabilitated dual-carriage ways such as inter-city highways leading to or bypassing headquarters of Local Government Areas (LGA), which major roads may also double as trans

Highways. For instance, Airport road along Uyo-Oron Road; Stadium road off Uyo-Abak road; Uyo Ikot Ekpen road, Uyo – Itu – Calabar highway; Uyo Ibesikpo – Eket road (Oil city destination) and Uyo – Idu Uruan road with University of Uyo, General Hospital, Anua as some institutions along the high way. The rural-urban fringe along these major dualized high ways have been developed as government projects into suburbanized areas with commercial and residential land uses at their peak demand.

Also the advantage that priced the rural-fringe land above its ordinary agricultural land use and thereby rendered the village land vulnerable to rapid penetration by urban development was their nearness to transport mode as well as to urban area (as market facility ) as analyzed by a German farmer, von Thunen (1783-1850 )(Wikipedia, 2013d).

The paltry proportion of 10% of the rural urban fringe left over for agricultural land use suggested gross diminution of arable agricultural land in the fringe. This was a very startling reality of urbanization expansion. In their study on supply and demand of land as of great economic significance, Amedo and Gollodge (1975), found that if more income went to the land or plot owner than he could have obtained from cultivation of the plot, agricultural land units might change for urban development use. Hence, the tendency of units of land close to urban centres to be given out for urban development under-ly the 90% consumption of arable agricultural land (village land) in the rural-urban areas around Uyo urban. The land owner obtained “best use” price for their un-sustainable, inelastic resource – village land.

#### 4.4. Rate of urban development penetration of rural-urban fringe

With 90% of rural-urban land engulfed by urban development and only 10% remaining as undeveloped (village) land, the rate of urban growth was significant. Data on previous land use survey in 1998 was compared with data on land use in 2009 (Table 5) to observe 10-year difference in land use in the rural-urban fringe. The following were obtained as land use ratio (LUR) and Land use growth Rate (LUGR).

##### 4.4.1. The land use ratio

The 10-year land use ratio (LUR) was the ratio of land use in rural-urban fringe in 2009 to the land use in 1998. Thus, the ratio of the total land was 1km<sup>2</sup> of village land in 1998 to 3km<sup>2</sup> of land in 2009, 10 years after. This means that the momentum of urban penetration into outskirts villages around the Uyo urban or central business district (CBD) in 2009 was galloping at three times the spread rate in 10 years previously (in 1998).

The land use ratios for the component urban development land uses were in the order: Transportation (384 units in 2009 to one unit in 1998) > 33 for commercial > 24 for industrial > 7 for institutional > 4 for residential, while undeveloped land diminished at a ratio of 0.4 or (<1) in 2009 to 1 in 1998. The quantum jump or astronomical rise in transportation land use in a decade (2009 – 1998) was not un-connected with the massive road network development in period 1999 till date. The second place rate ranking for residential land use growth was related to the housing development and urban renewal of the successive governments within the 10 years period studied and up to the present due to large influx of people with career and employment relevance in the urban state capital.

#### 4.4.2. Land use growth rate

The 10-year interval (1998 – 2009) land use growth rate also showed significant change, where land use growth rate is given as

$$\frac{dy}{dt} = C \quad (1)$$

where  $dy$  is the difference in land use between 2009 – 1998,  $dt= 10$  years, and  $C$  is the growth rate  $\text{km}^2/\text{year}$  or

$$y = Ct + a. \quad (2)$$

The growth rate  $C$  for the different land uses are given in Table 6 as follows:

**Table 6.** Land demand and use rate in 1998 – 2009 Outskirt Uyo Urban

land use	Growth rate, $\text{km}^2/\text{year}$
Transportation	4.788
Commercial	2.715
Residential	2.544
Institutional	1.710
Industrial	1.246
Undeveloped	-2.290 (diminished)

The leap-frogging in 10-year (1998 – 2009) urban development land uses in rural-urban fringe in Uyo municipality is a realism of the fact that the characteristic change in the fringe is significant from one decade to another or one development influence to another (wiki answers.com, 2013; Uk.ask.com, 2013); and its characteristics change over time from largely rural to largely urban (GEOCASES, 2013). The five sectoral developments (Table 4 and 6) gave a significant change ( $p < 0.01$ ) in urban development land use in the rural-urban fringe within a decade (1998 – 2009).

The diminution rate of undeveloped land use was not equal to the mean growth rate of the component land uses in urban development of the rural-urban fringe, indicating that land resource in the fringe was a depleting resource; when a piece of land was given out (supplied to demand), then it was not restored and was no longer available for agricultural land use. The negative sign (Table 6) was an indication that for the available land in the rural-urban fringe to grow variously at a cumulative rate higher than the diminishing rate of the undeveloped land, then the “neighbourhood” effect” (Wikipedia, 2013e) would take place, whereby the urban land use engulfed land in the closer rural areas first and foremost and then pulled in the

village land at remote or more distant areas; thereby expanding suburbanization further along major transport routes and diminishing agricultural land and workforce progressively into remote localities.

Thus, the diminishing trend of undeveloped land left for agricultural production clearly indicated that agricultural lands in rural-urban fringe were better used for purposes that could yield comparatively higher returns, than agricultural production. Suburbanization was achieving that goal around Uyo in the rural-urban fringe.

#### 4.5. Effect of previous land use on present urban development land use

Regression relationship was fitted between the previous (1998) and the present (2009) urban development land use of the rural-urban fringe (Table 4). A second degree (quadratic) predictive regression equation was obtained for the association as:

$$VLAN = 0.076VARO - 1.240 VARO^2 + 0.76, \quad (3)$$

with  $R^2 = 0.986$ ,  $Adj. R^2 = 0.977$ ; where VLAN is dependent variable (2009) land use area  $km^2$ , and VARO is 1998 land use for the multiple urban development land uses.

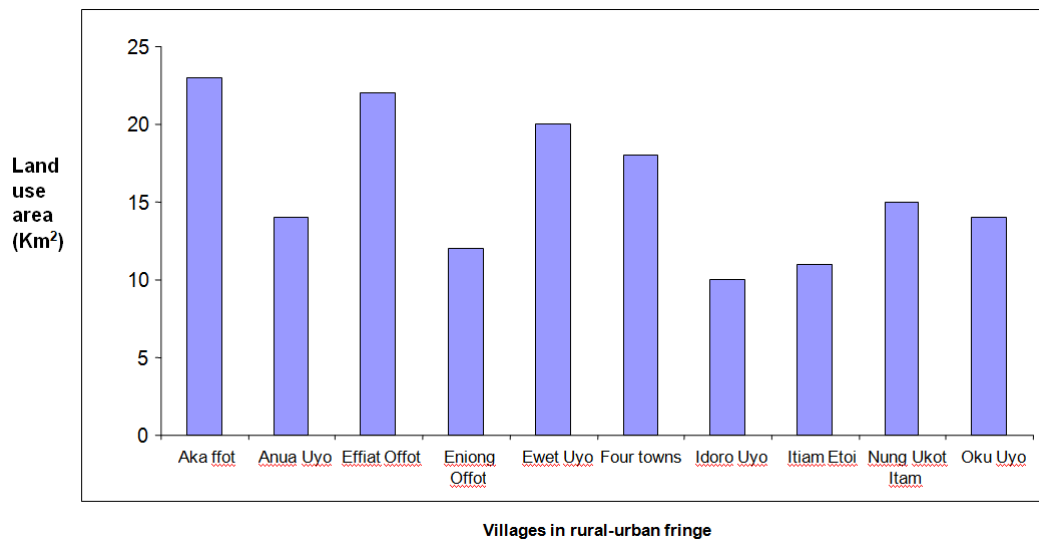
The level of significance in variable [Equation 3] was ( $P=0.05$ ), indicating that the measured values were not over-predicted.

The ANOVA between the 1998 – and the 2009 land use (supply) distribution for urban development showed a very significant difference at  $p < 0.01$ , indicating a clear advancement in land use demand for urban development of rural-urban fringe.

#### 4.6. Land use distribution amongst rural-urban fringe communities

The demand for land space in the rural-urban fringe by urban development land uses was highly variable and since no single community in the rural-urban fringe could supply the astronomical demand in 2009 (Tables 5 and 6), the urban expansion pressure engulfed many other surrounding villages in the rural-urban fringe to contribute to supply the land demand, thereby spreading suburbanization into the remote location of the rural-urban fringe (Figure 1), as many remote communities in the rural-urban fringe also contributed land for urban development. The contributions by the villages were compared amongst them by simple vertical bar charts (Figure 2), and show the four communities, which were at the closest proximity to urban verge in their direction of major transportation route, dominating. They were: Aka Offot along Uyo-Aka-Eket road, Effiat Offot along ring road 1 between Ikot Ekpene road and Oron road, Ewet Offot along Uyo-Idu-Uruan with Hotel Le'Meridian and University of Uyo as institutions, and Four Towns along Uyo-Abak road with State and Federal Secretariats and Olympic size stadium along the road.

The contribution of agricultural land by autonomous communities to urban development land uses also varied highly amongst them ( $Cv: 18.18 - 68.47\%$ , Table 5), and was brought about by inequality of supply against galloping demand by the type of urban development components spreading urban development to the fringe.



**Figure 2.** Distribution of Land Uses in contributory communities in Rural-urban fringe around Uyo metropolis

#### 4.7. Urban development influence on sustainability of agricultural production in rural-urban fringe

The results have shown that agricultural production on the rural fringe land could not be sustained for various reasons bordering on suburbanization of the fringe land. In the first place, there was no more available arable land in the outskirts to work on. Twenty years after State was created and Uyo was raised to capital of the State, 90% of the arable land in rural-urban fringe land were lost to suburbanization by urban development and expansion of the urban area (Uyo metropolis). Secondly, no feasible presence was seen of able bodied workforce for farming. All together over 80% of the able men and women who previously occupied and worked the arable farm to sustain a living for the families in the fringe, now worked in the urban, and preferred to reside only in the rural-urban fringe and commute to town to work.

Invariably, the new status and force of advancing urban development created new impetus, new employment focus, new ideas of lifestyle which, in aggregate, diminished the status and desire for farming in the rural-urban fringe. The commuters brought in taxiing, inter-city and intra-city transportation profession which young able men quickly registered to work. The associated automobile repairs gave young men the desire to be mechanics, vulcanizers, loaders and fee collectors from which they earned exciting payment unlike in subsistent farming where they waited for due season to end before they could earn their pay. Even the few aged persons dwelling there were doing so for want of age or youthfulness, and to earn a better price for their land in the form of rent on their old houses, or sale of such farmlands for superior prices, or develop such for residential purposes for urban workers, which gave him maximum profit more than tilling the soil.

Also, the ease of getting payment from the many phases of jobs under urban development made them to come into money more quickly, to establish faster returns and hence to become financially self-sustaining; and independent from parents or family lands and their usual succession and land ownership squabbles.

Hence, they totally ignored the profession of arable farming, preferring to buy what they needed with money in their pocket. Training into other profession was easily available and arranged. Hence, they were able to get professional expertise and become competent self-employers or workers or entrepreneurs, which created self-esteem which has been the want of human beings.

The negative (diminishing) rate of land supply (Table 6) against the high and positive (accelerating) rate of land demand in the rural-urban fringe shows that available land was so depleted at the proximity villages in the fringe, that land at the remote end of the fringe had to be called in. For instance, land at the four previous communities (Aka Offot, Effiat Offot, Ewet Offot, Four Towns (Table 5)) at close proximity to Uyo urban were so depleted by 14, 14, 13 and 11% of 159 km<sup>2</sup> respectively, that the remote neighbours were called in to supplement land supplies as follows: Itiam (7%) for Aka, Idoro (6%) and Nung Ukot (9%) for Effiat Offot, Anua (9%) and Eniong Offot (8%) for Ewet Uyo, and Oku (9%) for Four Towns (Table 5). This greatly advanced the expansion of suburbanization so that some close cities could coalesce into, perhaps, mega-urban area which could completely paralyze arable agricultural production in the fringe and cause a serious dearth of employment, and distress to the aged landowners (now landless) as well as distort the demography of the region. Government should focus on these problems now and come out with solutions.

## 5. Conclusion

Questionnaire survey was carried out in 2009 on ten villages in the rural-urban fringe (outskirt) of Uyo urban area to establish whether or not the diminution of agricultural (arable) land use was caused by urban development land use (for urban expansion). The hypothesis was tested with ANOVA for significant differences in the areal and percentage growth in land uses within a 10-year period (between 1998 and 2009). This gave the 20-year land use status since creation of the state entity in 1987. Five main urban development land uses for suburbanization of the outskirts land were identified in 2009 land use survey. The 2009 percentage growth in urban development land use were compared with 1998 land use survey, and showed growth rate in the following order: transportation > residential > commercial > institutional > industrial, while village land dwindled to only 10%. Transportation land use growth rate was the highest, leap-frogging at 4.788km<sup>2</sup>/year, while industrial land use was the least growth rate (1.246km<sup>2</sup>/year). Whereas the agricultural land use occupied 75.1% of the sampled villages in 1998, it significantly diminished to an infinitesimal area representing only 10.0% of the rural-fringe (villages) in 10-years interval (2009), showing that suburbanization of rural-urban fringe caused significant diminution of agricultural land use with no sustainability prospect to buffer against urban poverty. Regulation to avoid coalescing into other cities and to preserve ecosystem is recommended.

## 6. Recommendation

Rather than allow the rural-urban migration of able bodied men and women to urban areas in search of jobs and leave the weak and less agile persons in economic doldrums and increase urban poor population, a



buffer action should be entrenched in the rural-urban fringe such as creating appropriate economic balance (Todaro and Smith, 2010) by establishing technologies. This could be in the form of small-scale, less labour-intensive or manually aided, motorized agricultural processing industries, garden irrigation system for highly demanding green vegetables and fruits to supply the ready urban markets while reducing unemployment and impoverishment on rural-urban fringe villagers/land owners.

Also increased financial commitment should be made by government to improve social amenities which they can live with as they carry out cottage industry-based production or intensive cropping on designed garden to produce highly demanded quality products. The technology process brings in value-addition revenue to them as well as creates self-esteem to compensate them over the suburbanization of their land by investors who, in many cases, did not recruit them into sustainable employment but came with their already trained hands.

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