

## The Ecological and Demographic Imperatives of Land Fragmentation in Ute Districts of Vandeikya Local Government Area of Benue State, Nigeria

DANIEL SERKI ORTSEGA, PH.D

danortshan@yahoo.com

Department of Geography, Benue State University, Makurdi, PMB 102119, Makurdi  
NIGERIA

**Abstract** - This study set out to investigate land fragmentation in Ute Districts of Vandeikya Local Government Area of Benue State in Nigeria with a view to gaining insight into its nature, extent and effect on the socio-economy of the area. To achieve this objective, 129 farm plots together with their owners were randomly selected and studied. Dimensions of individual plots and distances between plots and owners' residences were determined through field measurements. A questionnaire survey was also conducted to obtain information on number of plots held per farming household in the area. In addition, aerial photographs taken over the area in 1977 and topographical maps of the area as well as reports were studied to get baseline data on the extent of fragmentation in the past. Analysis of data showed that, average size of farm plot in 1977 was 0.171 hectare, and declined to 0.149 hectare in 2009. Mean number of plots per farmer in 2009 was 5.37 and mean number of plots cultivated in the same year was 3.68, while range of plot holdings was between 2.67 and 10.00. Using Januszewski's index of fragmentation, a value of 0.173 was derived, indicating extreme pulverization of farm plots in the area. It was also found that farm plots were not only small, but also scattered over space. The study noted the diseconomies of land fragmentation arising from its severe limitation on mechanization and input investment in farm enterprise. It however recommends support for fragmentation in the area as a realistic response to ecological and demographic imperatives and as a way of stabilizing the socio-economy. It also recommends diversification from agriculture to other gainful activities in the area to augment proceeds from the small and inappropriately distributed farm plots.

**Key words:** Fragmentation, population, ecology, response, appropriateness, diversification.

### I. INTRODUCTION

The Hebrew expression that 'man is *adam* and land is *adama*' (Mather, 1986, p. 9) brings to mind the close link between man and land, and the centrality of land to his entire existence. He lives on land and exploits its resources for survival and well-being. Access to land therefore has always been a crucial factor in social and economic status in human societies, especially rural societies in which agriculture holds sway. Though important, land is ordinarily one of the most inelastic components of the earth surface. Nevertheless human population requiring it for survival grows in number faster than the affordable technology can extend frontiers of its usable portions. This axiom has been acknowledged by scholars like Malthus (cited in Weeks, 1999) and Hardin (1968).

Inelasticity of land is worsened by the politicization of access to it. Politicization places artificial boundaries within which members of communities can seek access to land. Trespassing such boundaries usually result in bitter conflicts. The implication of this is that, access to land must be gained through continuous fissioning of available usable land units in accordance with population growth in an agricultural area. This is the only common method of 'reproducing land' to meet new demands in agriculture-based, closed structure economies.

Moreover, land qualities are not uniform and none can be suitable for a wide range of crop varieties smallholder farmers produce, justifying the need to have access to a variety of land types. These demographic and ecological realities lead to division of land into progressively small holdings that are also widely dispersed in space. In other words, land fragmentation is a necessary response to ecological and demographic circumstances of an area (Niroula and Thapa, 2005).

Undoubtedly, the assertion that traditional agricultural structures characterized by fragmented non-geometric small plots limit application of farm machinery and new methods of cultivation aimed at increasing yield and reducing costs cannot be faulted. Empirical studies have reported this relationship between size of farm plot and efficiency of production. For instance, Arsalanbod (2000) reported that in irrigated wheat, increase in farm size by one percent results in 0.40% decrease in cost; and one percent decrease in fragmentation causes 0.44% reduction in cost. Similarly, Haidari (cited in Kalantari and Abdollahzadeh, 2008) found that land consolidation to curb fragmentation causes a 20% increase in yield. Generally, studies highlighting diseconomies of fragmentation assert that, the optimum farm size for economic production of a crop is 12 hectares (Soltani, in Kalantari and Abdollahzadeh, 2008).

However, in Sub-Saharan African countries, especially Nigeria, where industrialization process is either absent or very slow in occurrence, fragmentation remains an inevitable choice in the mean time. This is because it is the most socially appropriate response to population pressure and the attendant land scarcity. Additionally, it is the most affordable response to ecological challenge within the context of smallholder agriculture in which farmers produce a wide range of crops that require different soil qualities. In such contexts, access to different soil types and land units is critical for continued subsistence and limited participation in the market economy. In a context like this, it is unrealistic to think about land consolidation which involves the idea of 'exchange of spatially dispersed fragments of farm land to form new holdings at one place, or at few places as possible' (Oldenburg, cited in Dusabe, 2007, p.6).

Ute Districts in Benue State of Nigeria typify rural agricultural communities in which land fragmentation occurs as a necessary response to population and ecological challenges. To the extent that land fragmentation is an ecological and demographic imperative among agricultural communities in Nigeria generally, and in Ute Districts in particular; and to the extent that majority of farmers produce on fragmented farm lands, it was deemed useful to understand the nature of land fragmentation and its fuelling factors within the prevailing context of the study area. The main objective of the study therefore was to investigate the nature, drivers and inevitability of land fragmentation in the agriculture-based rural economy of Ute Districts in Vandeikya Local Government Area of Benue State in central Nigeria.

## II. Conceptual and theoretical overview

Fragmentation derives from 'fragment' which refers to an incomplete part or a piece that is detached from a whole it originally belonged to (Dijk, 2012). Similarly, Binn (cited in Dusabe, 2007) defines fragmentation as 'pulverization, scattering or morcellement and parcellization' of farm land. In other words, it is a type of land holding system in which 'a single farm consists of numerous discrete parcels, often scattered over a wide area.' While Dijk and Binn view fragmentation phenomenon from a geographic perspective, Kalantari and Abdollahzadeh (2008) combine spatial and economic perspectives in their conceptualization through the use of the dual notions of morcellement and parcellement. According to them, fragmentation refers to 'the subdivision of farm property into undersized units too small for rational exploitation (morcellement). It is also the excessive separation and dispersion of the parcels forming parts of a single farm (parcellement).'

Two theories have been used to explain why fragmentation of farm land occurs. One such theory wraps up several factors under the so-called 'supply-side' scheme of explanation. The supply-side scheme holds that fragmentation occurs as a result of exogenous factors which are beyond the control of an individual farmer. The factors include inheritance system, population pressure, imperfections in land market and breakdown of common property system. If the inheritance system is such that allows division of a parent's farm land among heirs, it leads to fragmentation of land. As a custom, the farmer has no control over it. Similarly, where there are no incentives for land consolidation and those unifying their farm land have no apparent benefits, fragmentation may continue unabated. This is the situation that is called 'imperfections in the land market' (Kalantari and Abdollahzadeh, 2008). No individual farmer can do anything about it. The supply side explanation also implicates the breakdown of common property system or communal production owing to rising individualization in the economy which encourages morcellization of farm land. As a macro phenomenon happening throughout a national economy, an individual farmer cannot stop it. The supply side factors are not decided by farmers, they cannot be controlled by them and therefore they encourage fragmentation of farm land.

The demand-side explanations of fragmentation emphasize all factors that are chosen willingly by farmers due to the benefits they expect to reap from fragmentation. Farmers decision in this regard are based on the premise that land anywhere is not homogenous, but vary with regard to location, soil type, water retention capacity, slope, altitude and agro-climate (Blarel et al., 1992; cited in Dirimanova, 2008). Dispersal of parcels of farm land therefore helps farmers to spread climatic and other risks. Small farm plots lessen the damage of soil erosion, crop disease invasion, drought and flood and fire disasters. These considerations are logical risk-spreading mechanisms in a context of no insurance, storage, credit and artificial nutrient inputs. The demand side explanations also posit that, in situations of missing commodity market, farmers tend to diversify their farm location and cropping mixture to satisfy their family consumption needs which are best met by fragmented land (Netting, 1972).

The supply-side and demand-side explanations are valid, and they reinforce the phenomenon of fragmentation in the study area. For any intervention to be meaningful and effective, conditions necessitating fragmentation have to be investigated and understood. Supply-side prompted fragmentation can only change if relevant aspects of culture shift. Similarly, demand-side prompted fragmentation can be stemmed if conditions relating to farmers' cropping decisions alter.

## III. MATERIALS AND METHOD

### The study area

Ute Districts lie between latitudes 6° 09' and 7° 01' north, and longitudes 8° 22' and 9° 11' east. The Districts are found in south-eastern part of Benue State, in the extreme eastern part of central Nigeria, near the border with the Republic of Cameroon. Spanning over 124 square kilometers, the area is underlain by basement complex rocks which are part of the western ends of the foothills of Cameroon Mountains. The area is generally low, lying between 100 and 300 metres above sea level. Many rivers drain the area, but of note are rivers Aya and Sambe which are both tributaries to Cross River. Soils of the area are dominantly of the tropical ferruginous type whose subgroups on the basis of texture of the surface horizon are hydromorphics, lithosols and laterites (Nyagba, 1995). The plains, interfluves and valley bottoms created by drainage network represent different land types which are suitable for different arable and tree crop land uses on the basis of demand-side considerations.

The area holds the highest rural population density in Benue State, and one of the highest rural population densities in Nigeria. By 2009, total population of the Districts was estimated from the census figures of National Population Commission (NPC) to be 88,851, giving a density of 717 persons per square kilometre (Ortserga, 2010). In an overwhelmingly agricultural economy, this density yields sufficient ground for land fragmentation from the supply-side in the area.

### Methods used in the study

All farming households together with their farm plots constituted the population of the study. A sample of 129 farm plots and their owners were selected from 36 villages in the area. The size of the sample was informed by the desire to achieve greater intensiveness of investigation than could be possible with a larger sample size. The area was sub-divided into five kindreds (sub-districts) based on the existing structure of the traditional administration. From each kindred, a proportionate number of villages were drawn; and from each village, a proportionate number of farm plots were chosen for close investigation.

In order to get an insight into the history of land fragmentation in the area, archival materials were searched; topographical maps and aerial photographs taken over the area in 1977 were also studied. Farm plots formed specific sites where sizes of farm plots were measured, and among which distances from plots to residences were measured. Linear tapes and global positioning system (GPS) served as the basic instruments for the field work. Along with field measurements, the study took detailed inventory of crops grown on the plots. In order to have an insight into the decision making process and propensity to land fragmentation at farm level, a questionnaire survey and interviews were conducted.

### IV. RESULTS AND DISCUSSION

The discussion of results centered on the nature of land fragmentation, drivers of the process and effect of fragmentation of farm land in Ute Districts. The analysis of field data is done with a view to showing that land fragmentation looms large in the area, and that the socio-economic equilibrium of the Districts rests firmly on the phenomenon.

#### Nature of land fragmentation in Ute Districts

##### *Morcellement of farm lands*

It can be said that Ute Districts are unarguably a smallholder agrarian community. Sizes of farm plots in the Districts are extremely small. This assessment is made with regard to the 12 hectares, generally accepted as optimum farm size for economic production of a crop (Soltani, in Kalantari and Abdollazadeh, 2008). Field investigation has revealed that sizes of farm plots in the study area are far below the optimum size level given in the literature. Sizes of farm plots in the area are shown in Table 1.

It can be seen from Table 1 that, village average size of farm plot in the sample ranges between 0.043 hectare and 0.347 hectare; while the study area's mean plot size is 0.149 hectare. No village in the sample shows average plot size of up to a hectare. Although averages hide specific variations in a data set, this study did not find any significant variation from the mean value. Analysis of individual farm plot sizes revealed a range of 0.0023 hectare to 0.5610 hectare. Compared with farm plot size data for the same area derived from aerial photographs of 1977, one finds that fragmentation has increased since that year in the Districts. In 1977 village means in the area ranged between 0.070 hectare and 0.351 hectare; and the study area's

average plot size was 0.171 hectare. This shows a decline in village average plot size by 0.016 hectare.

Table 1. Village average size of farm plots in Ute Districts of Vandeikya LGA

Village	Size of plot (hectare), 1977	Size of plot (hectare), 2009
1	0.116	0.272
2	0.261	0.261
3	0.179	0.175
4	0.182	0.140
5	0.304	0.108
6	0.277	0.235
7	0.171	0.206
8	0.351	0.195
9	0.224	0.109
10	0.120	0.263
11	0.077	0.057
12	0.134	0.347
13	0.083	0.107
14	0.113	0.111
15	0.077	0.152
16	0.198	0.043
17	0.129	0.203
18	0.102	0.168
19	0.304	0.161
20	0.250	0.343
21	0.147	0.049
22	0.175	0.233
23	0.211	0.154
24	0.089	0.113
25	0.185	0.057
26	0.174	0.149
27	0.230	0.148
28	0.100	0.141
29	0.185	0.091
30	0.085	0.047
31	0.170	0.045
32	0.180	0.092
33	0.102	0.080
34	0.111	0.081
35	0.091	0.092
36	0.259	0.125
<b>Average size</b>	<b>0.171</b>	<b>0.149</b>

Source: Air photographs, 1977 by SES-Meridian, Lancing, England; Field work, 2009.

It is clear that size of farm plot is one of the most unstable patterns of land use in Ute Districts. As has been mentioned earlier, when sizes of farm plots are small they discourage application of mechanical methods of farming, including economic investment in chemical and labour inputs on a farm.

##### *Parcellization of farm land*

One conspicuous feature of agricultural land use in Ute Districts is excessive separation and wide dispersion of plots

which should normally form a single farm. As a rule, no farmer covered in the sample reported a single contiguous farmland belonging to him. All of them reported varying number of plots scattered far apart from one another. As can be seen from Table 2, the study area's village average number of plots per household is 5.37; and village average number of plots per farming household ranges from 2.67 to 10.00 in the area. Over three-fifths of the plots were cultivated simultaneously at the time of field investigation.

Interview with some respondents during field investigation revealed extreme separation between plots belonging to some respondents to be as much as four kilometres. One interviewee reported a wild separation of as much as 10.00 kilometres between two plots he owned at the time of the study. The extent of parcellization in the area is shown in Table 2. As mentioned earlier, fragmentation is a way of adaptation to ecological and demographic circumstances by a backward agricultural system which can afford only traditional methods. It is clear that Ute Districts exemplify this scenario. So far, it is working for the community in the sense of containing the existing population pressure and ecological challenges in the area.

Table 2. Village mean number of plots per farm household in Ute Districts

Village	Village mean No. of plots held	Village mean No. of plots cultivated	Village mean % of plots cultivated
1	4.67	2.67	56.67
2	4.33	1.33	31.11
3	5.00	3.00	63.17
4	4.67	3.33	75.56
5	4.33	3.00	68.89
6	8.67	4.67	59.64
7	5.67	3.33	60.71
8	5.33	2.67	70.00
9	7.00	3.33	45.56
10	5.67	3.33	60.19
11	5.67	3.67	61.67
12	7.33	3.67	53.44
13	3.33	3.00	91.67
14	5.33	4.67	93.33
15	4.50	3.00	65.00
16	4.33	3.33	81.11
17	3.50	2.00	69.05
18	4.67	4.00	91.67
19	6.33	5.33	86.67
20	3.33	2.00	61.11
21	3.33	2.33	78.33
22	6.00	3.33	52.85
23	6.00	4.33	72.70
24	7.33	5.67	77.14
25	6.67	5.00	75.00
26	5.67	5.00	90.48

Table 2 (Cont.). Village mean number of plots per farm household in Ute Districts

Village	Village mean No. of plots held	Village mean No. of plots cultivated	Village mean % of plots cultivated
27	10.00	6.67	80.94
28	7.67	5.00	77.50
29	4.33	3.33	75.00
30	4.33	3.00	69.45
31	9.67	9.00	91.58
32	2.67	1.67	72.22
34	4.33	4.00	93.75
35	8.67	6.33	75.43
36	3.00	2.33	77.78
Average	5.37	3.68	69.62

Source: Field work, 2009

The effect of the level of Parcellization on farming enterprise in the Districts can easily be imagined. No scale economies can be hoped to be achieved in the area due to the obvious limitation this extent of fragmentation has on input investment in farming enterprise.

#### Extent of land parcellization in the area

To determine the degree of fragmentation in the area, the Januszewski's index of fragmentation was used. The index is defined as:

$$K = \frac{\sqrt{\sum a}}{\sum \sqrt{a}} \quad (1)$$

where K is index of fragmentation,  $a$  represents plot size. Values of the index range from 0 to 1. The value of 1 means that the farmer has all his land under a single contiguous land. Greater fragmentation (manifesting in increased number of small plots per farmer) is indicated by lower index value. Januszewski's index simply measures the number of plots and size distribution in an area (Raghbendra, Nagarajan & Prasanna, 2005).

Using the data in Table 2, the index works out as follows:

$$K = \frac{2.314}{13.384} = 0.173$$

The Januszewski's index for the area therefore shows extreme dispersal of plots in the area. When this index is considered along with the data in Table 2, the picture of severe fragmentation of farm land together with its attendant effect on economic viability of farm plots in Ute Districts becomes complete.

#### Driving forces of fragmentation in Ute Districts

##### *Population pressure and fragmentation of farm size in the area*

Ute Districts are the most densely settled rural area in Benue State, and one of the most densely populated rural areas in Nigeria. By 2009, the total population of the Districts was 88,851 settling an area of 124 square kilometres; and giving it a density of about 717 persons per square kilometre. For a place that does not practice intensive form of agriculture, this kind of density mounts severe pressure on land to the extent that

farming households no longer possess economically viable farm plot sizes. Available population records over the past 71 years show that this density has developed over time as can be seen in Table 3.

Table 3. Trend in population density of Ute Districts

Year	Population	Density per km <sup>2</sup>	Farm plot size (ha)
1938	9,548	77	2.146
1952	12,772	103	n.a.
1963	32,428	262	0.164
1991	50,575	408	n.a.
2009	88,851	717	0.149

Source: NAK/MAKPROF/4540; NPC, 1965, 1994 and projections; Briggs (1941); SES-Meridian (1977); Field work, 2009.

In a closed agrarian economy without any further land frontiers to appropriate as exists in the area, the only means of responding to the mounting population pressure is fissioning of farmlands to contain additional farmers. The sum effect of this response to the demographic dynamism is the dwindling scale of operation that is everywhere visible in the area. This finding is consistent with Bizimana, Nieuwoudt and Ferrer's (2004) finding in southern Rwanda.

#### Ecological base and land fragmentation in Ute Districts

Plot scatter in Ute District is hardly a choice, but a way of containing and managing a highly degraded and varied land environment with great propensity to weed invasion. By owning and simultaneously cultivating crops in different locations, farmers hope to share risks of crop failure among the widely dispersed plots so that if one plot fails to yield, they may fall back on other plots. And the scattered plots may add up to a meaningful acreage. Parcellization of farms in the area is basically necessitated by land variation and relief configuration. There are interfluves, plains and valley bottoms with differing textural, nutrient and moisture characteristics; and therefore varying resilience in productivity and proneness to weed and pest attack. The uplands have lost much of their resilience and are taken over after few months of fresh tillage by the stubborn red-flowered shrub (*Striga senegalensis*) and spear grass (*Imperata cylindrica*). Thus as many plots as can be got are required to rotate crop combinations.

A pattern of land ownership is increasingly assuming importance in the area owing to soil deterioration. Each farming household desires to have upland plots and a parcel on the valley bottom. This is because, the valley areas have higher moisture and nutrient status due to shallower water-table and annual receipt of sediments from adjacent higher lands. On such valley lands, multicropping takes place, involving rice and cassava in alternation. Owing to the special importance attached to the valley bottoms, they are more severely fragmented.

With this degree of parcellization of farm land, it is difficult to imagine how farmers manage work time moving between plots. One clear implication is that useful man hours are wasted moving between plots. Seeing against the

background of uneconomic sizes of plots as shown in Table 1, the picture of non-viability becomes complete.

#### The effects of fragmentation on agricultural production

##### Range of crops cultivated

The small farm plots in the area hold a wide range of crops. Crop mix on farm plots comprises root, cereal, vegetable and tree crops. The only exception to the general cropping pattern is rice (*Oryza sativa*) which is usually planted as sole crop on the floodable valley bottoms. The common crops produced in the area are shown in Table 4.

Table 4. Crops produced in Ute Districts of Vandeikya LGA, Benue State

Crop (English name)	Crop (Botanical name)
Yam	<i>Dioscorea spp.</i>
Coco yam	<i>Colocasia esculenta</i>
Sweet potato	<i>Ipomoea batatas</i>
Cassava	<i>Manihot esculenta</i>
Guinea corn	<i>Sorghum</i>
Beans	<i>Vigna unguiculata</i>
Rice	<i>Oryza sativa</i>
White melon	<i>Cucumeropsis mannii</i>
Brown melon	<i>Citrullus vulgaris</i>
Soyabean	<i>Glycine max</i>
Maize	<i>Zea mays</i>
Beniseed	<i>Sesamum indicum</i>
Okra	<i>Hibiscus esculentus</i>
Sorrel	<i>Hibiscus sabdariffa</i>
Groundnut	<i>Arachis hypogea' L</i>
Orange	<i>Citrus spp</i>
Mango	<i>Mangifera indica</i>

Source: Field work, 2009.

Planting of a wide variety of crops on a single small plot is a system of adaptation to ecological and economic realities in the area. Ecologically, soils in the area have been exhausted from long period of sustained use. And under inadequately developed forces of production, most crops no longer yield well. Farmers therefore plant as many crops as are compatible on a single plot as a risk management mechanism, so that if one crop fails they can fall back on the others. It is also, a form of non-industrial land use intensification which is typically imposed by technological backwardness. Economic rationale of multiple interplanting lies in the tendency for self-sufficiency that is characteristic of agriculture that shares between family consumption and exchange. Moreover, the ever unstable produce market which exists in developing nations makes farmers to plant as many crops as possible on their available holdings, no matter how small they are, to serve as shock absorbers to wild price fluctuations.

Even if fragmentation is eliminated from agricultural landscape of the Districts in favour of consolidation, no useful purpose would be achieved under the existing production circumstances. Farmers would still not be able to raise productivity because of the prevailing use of traditional forces and methods of production. Large scale production, especially

the one centering on single crop, is not adaptable to a techno-social milieu that consists of simple traditional tools, traditional crop varieties, poor knowledge of environmental protection, limited access to efficient produce market and a 'culture of all farmers'.

#### Distance to the farm plots in Ute Districts

The price farmers in the Districts have to pay for adapting to the existing context of production through fragmentation is increasing distance they have to travel between their residences and the widely dispersed farm plots. Distances between residences and farm plots are increasing with growing population pressure in the area. A comparative data on distance between 1977 and 2009 shows this tendency. What is shown in Table 5 is only the village average picture of distances between residences and farm plots in the area. Specific cases are far in excess of what is shown in this table. For example, a respondent reported a 10 kilometre distance between his residence and one of his farm plots. This extent of parcellization takes up a lot of useful man hours for walking to plots, such that labour investment in the actual farm work suffers, and consequently farmer's productivity is reduced.

Even with this kind of distances separating residences from farm plots, it is still an adaptation that has proved effective in sustaining community life and preventing social upheavals which might arise from landlessness under land consolidation. Thus the rural agrarian economy of the area has remained functional.

#### Effect of fragmentation on social capital and social networks in the Districts

Until recently, land dealing in the area was based entirely on the level of social capital and informal social networks built between informal land administrators and those seeking access to land. Social capital refers to informal ties, trust and popularity that exist among members of a community. High social capital facilitated relatively greater consolidation of farms in Ute Districts in the past. The same social capital afforded the area a fragmentation that did not involve use of money. At present however, social capital has declined in the area; and with the decline, economic relations are emerging in land transaction involving pledge, rent, borrowing and outright purchase.

Similarly, use of informal networks (ties among people of same clan, social status and age-set) in land transactions was in the past restricted within one's immediate community and paternal relatives. At the time of this study however, social networks have widened beyond one's extended family circle to cover an entire district and even beyond. Fragmentation has accordingly become more universal as people use such networks to acquire pieces of land outside their local communities. The changes in social capital and informal networks have led to increase in both morcellement and parcellement of land in the Districts.

Table 5 shows the distance between residence and farm plots in Ute Districts in 1977 and 2009.

Table 5. Distance between residence and farm plots in Ute Districts in 1977 and 2009

Villages	Average distance (km) in 1977	Average distance (km) in 2009
1	0.093	0.374
2	0.143	0.287
3	0.093	0.186
4	0.031	0.181
5	0.047	0.257
6	0.083	0.168
7	0.063	0.501
8	0.034	0.248
9	0.032	0.543
10	0.067	0.163
11	0.073	0.081
12	0.145	0.066
13	0.033	0.503
14	0.240	0.943
15	0.157	0.873
16	0.040	1.228
17	0.159	0.637
18	0.093	0.706
19	0.120	1.609
20	0.130	0.117
21	0.090	0.099
22	0.068	0.414
23	0.100	0.521
24	0.043	0.241
25	0.087	0.035
26	0.103	0.006
27	0.190	0.260
28	0.053	0.168
29	0.093	1.018
30	0.143	1.483
31	0.263	1.247
32	0.370	0.352
33	0.203	3.406
34	0.327	1.566
35	0.290	0.299
36	0.133	0.942
Mean	0.123	0.569

Source: Extracted from aerial photographs, SES-Meridian, Port Harcourt and Lancing, 1977 and Field work, 2009.

#### V. CONCLUSION

This study set out to investigate the nature, extent, drivers and the inevitability of land fragmentation in Ute Districts, with a view to gaining deeper insight into the phenomenon. The investigation has revealed that farmlands in the area are severely pulverized. This is clearly expressed by empirical data on sizes of farm plots in the area. By any standard, a farm plot size of 0.0023 hectare is too small to permit any meaningful farm enterprise; yet such a size exists in the area, and no single farm plot in the sample was near one hectare. The largest single plot was 0.5610 hectare. Similarly, the study found that plots of farms are excessively separated and widely dispersed. Village

mean number of plots per farmer was 5.37; and a family holding of 10 plots was reported. Extreme dispersal of farm plots in the Districts is clearly manifested in Januzewski's index of 0.173.

The phenomenon of fragmentation in the area has been explained by the steady increase in population pressure and ecological imposition on the area. On the severely fragmented farm lands, an assortment of crops is grown. This is typical of smallholder farming which is usually sensitive to the subsistence needs of the farming household. And a wide range of crops is the best form of adaptation to fragmented farmlands under traditional methods of farming as is the case in the study area.

The implications of land fragmentation on agricultural economy and wellbeing of farmers have been dealt with extensively in Arsalanbod (2000), Bizimana, Nieuwoudt and Ferrer (2004), and Kalantari and Abdollahzadeh (2008). Suffice to say here that, it hinders realization of scale economies by the farmer through its limitation on input investment and labour efficiency.

However, depending on the context and purpose of a farming enterprise, fragmentation is not altogether an evil. Its undebatable value in risk spreading and assurance of subsistence to the farmer makes it desirable. Similarly, its value in 'reproducing' land to meet ever rising demand for land, an otherwise inelastic resource, makes it a necessary 'evil' that cannot be avoided in most rural communities in Nigeria in general and in Ute Districts in particular. By it too, most rural communities in Sub-Saharan Africa generally, and Nigeria especially, have been able to prevent emergence of landless classes which would have worsened the already bad socio-political situation in the region.

Based on the above findings therefore, the study recommends that no land consolidation policy should be contemplated for Ute Districts and other areas in similar demographic, ecological and socio-economic circumstances, until economic diversification is achieved. Rather, policy should be devised to preserve the relevance of fragmentation as a stabilizer of rural community life, its socio-economy and the wider national polity. Such a policy, as Bryceson (2002) suggests, must broadly stem from reorientation of rural livelihoods. But specifically for Ute Districts and other rural communities with similar monolithic agrarian economies, such a policy must aggressively create contexts for pluriactivity. This means diversification of the rural economy into other gainful activities than agriculture.

## REFERENCES

- Arsalanbod, M.R. (2000) Effect of farm smallness and fragmentation of productive units on Production cost: Case of irrigated wheat in West Azerbaijan. *Agric. Econ. Dev. Quarterly* J. 8 (2)
- Bizimana, C., Nieuwoudt, WL & Ferrer, SRD (2004) Farm size, land fragmentation and economic efficiency in Southern Rwanda. *Agrekon*, Vol 43, No. 2 (June, 2004), pp. 244- 262.
- Bryceson, D.H. (2002) The scramble in Africa: Reorienting rural livelihoods. *World Development* Vol. 30, No. 5, pp. 725-739.
- Dijk, T. Online. Dealing with Central European land fragmentation: A critical assessment on the use of Western European instruments [Article on the internet] 8 April 2012 [Cited 9 April 2012]. Available from <http://www.4cli.org/celk/celknew/datatrs>
- Dirimanova, V. Online. The importance of local networks for solving land fragmentation Problems in Bulgaria [Article on internet] 18 January 2012 [Cited 19 January 2012]. Available from [http://iasc/2008.glos.ac.uk/conference\\_%20papers/D/Dirimanova](http://iasc/2008.glos.ac.uk/conference_%20papers/D/Dirimanova)
- Dusabe, S. (2007) Land consolidation and cooperative farming: managing land scarcity and decline of productivity in Rwanda (M.A. dissertation). Graduate School of Development Studies, Institute of Social Studies, the Hague.
- Hardin, G. (1968) The tragedy of the commons. *Science* 162, pp. 1243-48.
- Kalantari, K. and Abdollahzadeh, G. (2008) Factors affecting agricultural land fragmentation in Iran: A case study of Ramjerd sub District in Fars Province. *American Journal of Agricultural and Biological Sciences* 3 (1): 358-363, 2008.
- Mather, A.S. (1986) *Land Use*. Longman, London.
- Netting, R. (1972) Of men and meadows: Strategies of Alpine land use. *Anthropological Q.*, 45:145-57.
- Niroula, G. and Thapa, G. Online. Impacts and causes of land fragmentation, and lessons from learned from land consolidation in South China. *Environmental Sciences : Miscellaneous Paper* [Article on the internet] 19 July 2012 [Cited 20 July 2012]. Available from <http://www.mendeley.com/research/impacts-cause-land-fragmentation>;
- Nyagba, J.L. (1995) The geography of Benue State. In Denga, D.I. (ed.) *Benue State: The Land of Great Potentials*, pp. 84-97. Rapid Educational Publishers, Calabar
- Ortserga, D.S. (2010) Emerging patterns of agricultural land use in Ute Districts of Vandeikya Local Government Area of Benue State, Nigeria. Ph.D thesis, submitted to Postgraduate School, Benue State University, Makurdi, Nigeria.
- Weeks, J.R. (1999) *Population: An introduction to concepts and issues*. Wadsworth publishing Company, Belmont. Seventh edition.