

SCOTTISH JOURNAL OF  
ARTS, SOCIAL SCIENCES  
AND  
SCIENTIFIC STUDIES

---

---

VOLUME 18, ISSUE II  
March, 2014

**Articles**

---

<b>The Effect of Calcination and Grain Size on the Character of Granite Based Glaze.</b>	<b>3</b>
<i>Alkali Vershima,</i> .....	3
<i>Tukur D.M. Zauro</i> .....	3
<i>Garkida A.Dzikwi</i> .....	3
<b>Who Pays For The Budget of The European Union?</b> .....	<b>9</b>
<i>Herman Matthijs</i> .....	9
<b>Expression of Acetylcholinesterase after neuronal-differentiation NG108-15 cells ..</b>	<b>22</b>
<i>Prawpan S.,</i> .....	22
<i>Sukkid Y.</i> .....	22
<b>Effectiveness of Non-Governmental Organisations in Poverty Reduction in Kasena-Nankana and Builsa Districts in North-Eastern Ghana</b> .....	<b>30</b>
<i>Kanlisi Kaba Simon</i> .....	30
<i>Arkum Thaddeus Aasoglenang,</i> .....	30
<b>The Impact of Mergers and Acquisitions on Shareholders' Wealth: Evidence from Nigeria</b> .....	<b>54</b>
<i>Abeleje Kayode Richard,</i> .....	54
<i>Liafisu Sina Yekini</i> .....	54
<b>A Comparative Study on the Fermentability of Camel and Cow's Milk by a Symbiotic Blend of Lactic Acid Cultures</b> .....	<b>68</b>
<i>Amin O. Igwegbe</i> .....	68

<i>Charles A. Negbenebor</i> .....	68
<i>Elizabeth C. Chibuzo</i> .....	68
<b>Utilization of Manganese from Waste Batteries for Inclusion in Ceramic Bodies for Special Effects</b> .....	<b>76</b>
<i>Alkali Vershima</i> .....	76
<i>Abraham D. Morakinyo</i> .....	76
<i>Tukur D. M. Zauko</i> .....	76

# The Effect of Calcination and Grain Size on the Character of Granite Based Glaze

---

**Alkali Vershima,**

*Department of Industrial Design Ahmadu Bello University (Abu), Zaria*

**Tukur D.M. Zauro**

*Department of Industrial Design Ahmadu Bello University (Abu), Zaria*

**Garkida A.Dzikwi**

*Department of Industrial Design Ahmadu Bello University (Abu), Zaria*

## **Abstract**

The utilization of granite sawing dust as a substitute to feldspar in the formulation of ceramic glazes is the central focus of this paper. The paper aims at determining the general character of the glaze batch made from granite dust. Granite dust collected from quarry site was split into two equal parts. Part A was calcined to 900<sup>0</sup>C, while part B was left in its natural state. Two glaze batches of the same measurement were composed, one from the calcined granite and the other from the raw granite. These were milled to 180 microns and applied on two separate sets of wares and fired to between 1160-1200<sup>0</sup>c. Result showed that batch A made from calcined granite fused much earlier at 1160<sup>0</sup>c than batch B. At 1200<sup>0</sup>c, the fusion was complete with batch A showing greater fluidity, brilliance and improved surface appearance than batch B. This proved that calcined and fine grain size of batch A improved the general character of the granite based glaze.

## Introduction

Glazes are the principal component of any successful table ware and decorative ceramics. It is one of the means through which the ceramists express himself. It is one of the attributes that brings fascination and aesthetic appeal to the ceramic ware, apart from providing clean and hygienic surfaces.

The knowledge of materials and the behaviour of glazes of a particular mixture and processing methods is an exciting art in glaze making. Thus glaze making is regarded as a complex science but equally an interesting art. The colour outcome from addition of oxides, the fluxing behaviour from addition of major fluxes, the effect of clay bodies on colour outcome and physical outlook, the effect of temperature variation on glazes and the atmosphere which they are fired as well as methods of application provide a wide range of variations in the behaviour and appearance of glazes. This constitutes an unending source of information and avenues for more research.

There is hardly a single material in nature that makes a successful glaze. Nelson (1966). It is a combination of several materials rightly processed and formulated that makes a successful glaze. The use of granite in formulating glazes though not entirely a new art, yet has attracted very little interest among ceramic practitioners. The materials used for ceramics production are hardly in a state of purity and fines. They therefore require some basic processing before they are used. This view is supported by Opoku (2007), who argued that the only way chemical purity and other physical properties are enhanced is by beneficiation.

The advantage that granite offers is that, it is naturally processed through the process of quarrying, and other treatments that follow are based on the desired result the potter wishes to obtain. With the economic constraints most potters face, it is important for potters to take advantage of unexplored areas of mining and beneficiation of industrial minerals so as to save cost and energy. Hence the use of granite waste from quarry sites as a major constituent of the glaze under study. Riana (2012). Recommend its use to the full extent possible for all kinds of structural and engineering purposes.

According to Conrad (1980) it is an established fact that the different treatment given to materials of the same nature and composition can change the character and behaviour of a glaze completely. The essence of this experiment is to use granite waste in combination with Ball clay and wood Ash, compose a glaze batch and subject it to different treatment to determine the character and behaviour of this glaze. Calcination and grain size can have effect on the the behavioural pattern of ceramic materials.

Calcination refers to the heating of materials or mineral in order to decompose them. Michelle (1995) affirmed that calcination is known to produce active ceramic powders with excellent sinterability. Calcination apart from helping the potter to obtain lower melting temperature, it makes it easy to obtain a particle size much finer than 1 to 40 microns.

Lower calcination temperatures are known to produce very fine glaze surfaces. Although heating above the decomposition temperature of 9000C could be counter productive as this may result to increased particle size to the point of making the material very coarse and in active as well as dead burnt, which could only be used as a refractory. Calcination is also regarded as a final step in the production of high purity ceramic materials. Calcination reaction is therefore known to play a major role in the synthetic blend of glaze composition. The difference in expansion rate of either clay bodies or glazes is a function of grain size and calcination.

Sintering of materials in ceramic production is intended to enhance the fluxing behaviour of materials, improve compactibility, hardness, strength, corrosion resistance and toughness. Each of these properties is achieved by the degree of calcination of materials. Thus from sintering

standpoint, a low calcination temperature of materials and a decrease in particle size could be very advantageous, because smaller particles lead to more rapid sintering rates and high strength.

Experiment by bray (2000) reveal that, the longer the grinding of materials, the more plastic and finer the grain size. When particle size decrease from 1-0.01 microns, experiment shows that sintering time decreases by 30 minute -1 hour and consequently the temperature at which a material is fired reduces considerably and cost of production equally drops.

### Methodology

Granite dust was obtained from quarry sites in Zaria local government in Kaduna state along side with ball clay wood ash. Granite powder was taken for chemical analysis to determine its chemical composition .Bellow is the table showing the result of the analysis carried out.

**Table 1a Granite waste**

Compo und	Al	Si	S	K	Ca	Ti	V	Mn	Fe	Cu	Zn	Ba	Eu	Re
Conc unit	11.8%	59.4%	0.089%	11.3%	5.06%	1.22%	0.032%	0.19%	10.33%	0.026%	0.058	0.35%	0.16%	0.09%

Granite dust was brought into the ceramic studio at Ahmadu Bello University Zaria and calcined to 9000C in a kerosene kiln. Ball clay and wood ash were used in combination with granite to formulate two glaze batches each weighing 5kg. The first batch was made from the calcined granite dust and milled for 6 hours to the grain size of 180 microns, the equivalent of mesh 80. This batch for the purpose of identification was labeled batch (A). The second batch was made from raw granite and milled for just one hour. 125 microns of grain size was obtained which equals mesh 120. This is labeled batch (B). The formula for both batches was:

- Granite 60%
- Wood Ash 20%
- Ball clay 20%

These two glaze batches were applied on two test bars and cups. It is important to know that while doing this, care was taken to obtain the required viscosity in order to achieve uniformity in thickness during glazing. It is observed by Bray *ibid*, that several glaze faults arise from either too thin application of glaze or thick glazing. Therefore moderate consistency is suggested for optimal result. These were allowed to dry and their bases cleaned and arranged in the lowest firing spot in the Kiln and placed in the same position. Firing was carried out to two different temperatures at different times, one of 11600C and the second at 12000C. Upon cooling, these were brought out for physical examination and analysis.



Plate 1 and 2, showed samples of fired /finished products.



### **Results and Findings**

Upon successful firing of the two samples at two different temperatures, the following observations were made:-

The first observation noted after the two samples were brought out from the kiln was the sintering that began to occur on tile with glaze batch A. And the none - fusion of the glaze applied on batch B. This explains the position that materials with finer particles tend to break down faster and under lower temperatures than materials with larger particles.

The second observation noted on samples fired to 12000c was that, both glazes fused completely. However, batch A showed greater fluidity and brilliance than batch B.

The third observation was that Batch A of the completely fused samples showed no sign of any glaze defect, while batch B indicated some degree of crazing.

The fourth observation had to do with the colour effect. Batch A appeared darker in colour while batch B appeared transparent with light yellowish hues.

### **Discussion**

The high fluidity, shine and smooth surface noticed in samples with batch A, is an indication that calcination and fine grain size materials helps in promoting the fluxing behaviour of glazes as well as enhancing its shine and the convenience of handling and cleaning. It must not be forgotten that one of the principal functions of a glaze is to close the existing pores in a clay body, thus promoting imperviousness of the body and the health safety of the user. Thus this batch can be said to possess all the qualities of a successful glaze.

It is equally established, as noted by Brian (1987) that, one of the possible causes of crazing which was identified in batch B is insufficient grinding of quartz which slows easy conversion at lower or medium temperatures. Since one of the dominant material in granite is quartz it is little surprising that this reaction occurred.

It was observed that the granite calcined turned brownish in colour while the one not calcined remained grayish. This possibly accounts for the colour variation in the two samples. There could be other scientific explanation to this colour phenomenon but since one could not subject the samples to other scientific investigations through the use of Scanning Electronic Microscopy (SEM) as suggested by Xavier e, Tal (2011), this was left for further studies.

Finally, the firing range and time spent in firing could be drastically reduced when one calcines and reduces glaze materials to finer grain sizes. Firing at 12000C and attaining fusion and complete sintering was an added economic advantage and a reduction in the man hours spent in firing.

### **Conclusion**

There are several variables that correlate when one embarks on ceramic production. These variables range from material processing, right combination and composition of materials, physical alteration of materials and formation of forms, and then the firing of objects formed. For the purpose of convenience, cost of production, aesthetic appeal, time and energy spent, it is advised that more innovative experiments be conducted to achieve ceramics with lower cost and less stress in the processing of materials used. More creativity is advocated in the composition of materials and the characteristic alteration in their behaviour which shows in their surface finishing and aesthetic appeal. This view equally falls within the recommendations of Duke (2009) on best practices in waste utilization for innovative and aesthetic purposes.

## References

- Alkali V. Garkia A.D. 2006. "Utilization of Granite Sawing Waste in Ceramic Composite Bodies". Joscilt International Journal on Science Laboratory Technology. Vol. 6 September 2006. p. 55.
- Bray C. 2000 "Ceramic and Glass": A Basic Technology". Society of Glass Technology. Don Valley House Savile Street, East Sheffield.
- Brian S. 1987 "Glazes From Natural Sources" A working Hand Book for Potters". A & C Black, London University of Pennsylvania Press Philadelphia.
- Conrad J.W. 1980) "Contemporary Ceramic Formulas" Macmillan Publishers ince. Now York.
- Duke P. 2009. Recommendations on Best Practices in Waste Exploitation. Natural Stone Council NSC Crestwood Drive Hollis, New Hampshire.
- Michelle M.G. (1995) "Engineering Materials Handbook" ASM International Materials Information Society USA.
- Opoku E.V. (2009) "Contemporary Developments in Ceramic Materials: Development of Local Raw Materials for the Ceramic Industry in Nigeria". Ashakwu, Journal of Ceramics vol. 2, No. 1 June 2007 P. 84-88.
- Rania A.H., Sahah E. and Safwan K. (2011) "Marble and Granite Waste: Characterization and Utilization in Concrete Bricks". International Journal of Bioscience, Biochemistry and Bioinformatics. Vol. 1 No. 4 November, 2011.
- Xavier G.D.C, Saboya F, Maia P.C.D.A and Alexandre J. (2011) "Considerations about Degradation of Red Ceramic Material Manufactured with Granite Waste" UENF Department of Civil Engineering, Campos Rio de Janeiro, Brazil.



# Who Pays For The Budget of The European Union?

---

**Herman Matthijs**

*Vrije Universiteit Brussel – Free University Brussels*

*Teaches public finances, public administration, and EU budget*

*Address: Herfstlaan 17, 8200 BRUGGE (Belgium)*

*Email: herman.matthijs@skynet.be*

## **Abstract**

The European Union (E.U.) has a special system of financing its institutions. The system has been the subject of political discussion for many years. Is it sufficiently fair and transparent? The current financing system has been in place since 1970, but has come under increasing pressure as a result of the growth of the number of member states and growing economic disparity between the member states. The question of whether to rely on its own sources of finance or on contributions from its members is the subject of a separate political argument.

## Introduction

This study examines the way the European Union is financed. The current system relies on resources derived from customs duties and value added tax and on national contributions based on “GNI” (Gross National Income). The numerical data presented here is drawn from the primary source, namely the figures in the EU budgets, and supplemented in some instances by figures contained in scientific publications on the subject (see footnote 1).

Specifically this article pursues the following lines of inquiry:

- How have the “own resources” evolved in recent decades,
- How much do members contribute to the financing of the EU budget, ranked per capita and general funding,
- What are the future alternatives for the EU budget?

## History

Since the birth of European cooperation with the establishment of the “European Coal and Steel Community” (ECSC) in 1951, the political leaders of the various member states have had to negotiate arrangements for the financing of the new supranational institutions<sup>1</sup>.

The general budget of the European Union has always been an issue with a high political profile.

During the past 60 years the European Union has repeatedly revised the way finance is made available to the EU budget and has implemented numerous budgetary reforms. Many of these changes have been related to the growth of European integration from the six of 1951 to the present 28 member states (Croatia became a member on 1 July, 2013).

In 1970 the six member states agreed on a fundamental change to the financing of the European Communities (EC) in order to democratize budget procedures.

The Council Decision, or Luxembourg Decision, of 21 April 1970 (Official Journal: L edition no. 94, 28 April 1970) introduced the principle of “own resources” for the financing of the general budget from customs duties, agricultural levies, and the transfer of no more than 1% of VAT revenues from the member states to the EC.

In June 1984 the European summit at Fontainebleau concluded with the adoption of a new Council decision (no. 257 of 7 May 1985 in Official Journal: L edition no. 128, 14 May 1985) in which the UK obtained an even more favourable arrangement and which became part of the new “own resources” decision. The fact that this “own resources” decision can only be amended by the unanimous agreement of the member states meant that the UK’s “fair return” principle became firmly established in the political policy-making process.

The Brussels summit of February 1988 resulted in an amendment to the decision of 1985 by the Council (no. 376 of 24 June 1988 in Official Journal : L edition no. 185, 15 July 1988).

This signalled the decline of VAT as the most important own resource.

---

<sup>1</sup> KERREMANS, B., & MATTHIJS, H., *De begroting en de openbare financiën van de Europese Unie*, Intersentia editions, 2004 (second edition); STRASSER, D., *Les finances de l’Europe*, Paris, LGDJ édition, 1990; LINDNER, J., *Conflict and change in E.U. budgetary politics*, London, Routledge, 2005; VIessant, C., *Les communautés et l’Union Européennes*, in: *Les finances de l’Europe*, by: G. ORSONI (ed.), Paris, Economica éditions, 2007, p. 473-510 ; MATTHIJS, H., “De begroting van de Europese Unie”, *SEW (Tijdschrift voor Europees en Economisch recht)*, 2010, vol. 2, p. 51-60.

Measures were adopted at this Council meeting in Brussels (February 1988) aimed at imposing restrictions on agricultural expenditure.

Budgetary discipline was also linked to the five year lifetime of the legislature elected to the European Parliament.

Because of the limited availability of own resources a new source of finance was introduced in the form of a contribution from the member states based on their GDP as a percentage of the GDP of the community as a whole. This is to the advantage of the poorer member states, despite the own resources system being abandoned in favour of this prosperity-based system.

## **I. The present financial system**

Post 1970 several systems have been used to finance the EU budget .

The European Council at Brussels of 15 and 16 December 2005 laid the basis of a new financial system for the general budget of the European Communities which culminated in the council decision<sup>2</sup> of 2007.

As a consequence of the new council decision on own resources the following sources of finance were earmarked for the general budget of the European Communities.

The financial system of the European Union is based on a council decision. This means that it is the member states that decide. This accords with article 311 of the Lisbon treaty (on the functioning of the EU), which says that the arrangements relating to the union's own resources must be unanimously decided by the council.

Effectively this means that every member state can veto proposals aimed at changing the system.

The European Union has its "own resources" to finance its expenditure. The member states collect these on behalf of the EU and transfer them to the EU budget.

There are three kinds of own resources, namely:

- "Traditional own resources" (TOR) – these mainly consist of duties charged on imports of products coming from non-EU States.

- The resource based on the "Value Added Tax "(VAT) is a uniform percentage rate applied to each Member State's harmonized VAT revenue.

- The resource based on "Gross National Income" (GNI) is a uniform percentage rate applied to the GNI of each Member State. Although originally a balancing item, it is this that has become the largest source of revenue.

The budget also receives other revenue, such as the tax paid by EU employees on their salaries, contributions from non-EU countries to certain EU programmes, and fines imposed on companies found to be in breach of EU competition and other law. These miscellaneous resources represent about 2 % of the budget.

## **A. Customs Duties**

Duties are a tax on imports levied at the external borders of the Union. Common customs tariffs were set in 1968, two years earlier than planned. In the Treaty of Rome customs duty was designated as the primary source of finance for the expenditure of the European Economic Community. In 1988 the regime was extended to include the customs duties levied by the European Coal and Steel Community.

---

<sup>2</sup> Council Decision no. 436 of 7 June 2007 on the European Communities' system of own resources. Official Journal, Series L, no. 163, 23 June 2007 . This new system came into effect on 1 March 2009.

The customs services of the member states collect the money and 25 percent of revenues are retained by the national budget to cover collection costs.

Agricultural levies were instituted in 1962 and were transferred to the Community by the decision of 21 April 1970. Originally these were taxes which varied according to the price in global markets and the price in the European market. Since the multilateral trade agreements of the Uruguay Round (April 1994) were taken up into Community law no distinction is made between agricultural levies and customs duties. Agricultural levies are now simply customs duties imposed on agricultural products imported from third countries.

Here again the member states may retain 25 % of these revenues for their national budgets.

Levies and contributions on sugar: these levies are somewhat different in nature because they affect sugar-producing enterprises, who have to pay a production levy in order to cover the cost of supporting the market and a storage levy that serves to ensure the regular marketing of sugar.

The levies on the production of isoglucose are a third source of revenues in the agricultural products sector. They serve the same purpose as the sugar levies (even though isoglucose is not an agricultural product). The legal basis of this levy has been repeatedly called into question, although it is, following rulings by the Court of Justice, now regarded as an effective levy.

The results of the Uruguay Round (April 1994) of multilateral trade negotiations have now been taken up in EU (European Union) law. As a result there is no longer any real difference between agricultural levies and customs duties. For this reason the old distinction between agricultural levy and customs duty can no longer be made in the context of the general budget. The distinction ceased to be made in 2010.

As of the year 2010 the “traditional own resources” comprise customs duties and the levies on the sugar industry.

## **B. VAT**

The “Value Added Tax” (VAT) was established by the decision of 21 April 1970 because the traditional own resources provided insufficient finance for the community budget. The harmonization of this complex resource demanded much time, so that it was only first collected in 1980. The VAT resources are the result of the application of a specific percentage to a uniformly established basis. In the period from 1988 to 1994 the basis was set at a maximum of 55% of the GDP of member states. As of 1995 this was capped at 50% for those member states in which per capita GDP was lower than 90% of the community share. This maximum was gradually extended between 1995 and 1999 so that it became applicable to all member states.

The 1970 decision limited the maximum percentage that could be called in from VAT revenues to 1% of a specified tax base. The second decision on the own resources, dating from 7 May 1985, increased the percentage to 1.4%, effective as of 1 January 1986 when the Community was enlarged to include Spain and Portugal. This increase was needed in order to fund the costs of enlargement. A fourth decision on own resources, dated 31 October 1994, however, provided for a gradual return to the ceiling of 1 % in the 1995 – 1999 period, primarily for reasons of fairness. The maximum rate of call was reduced by the Council decision of 2000 to 0.5% of the maximum level of the harmonized VAT base. The new decision of 2007 set the maximum rate of call at 0.30%.

## **C. GNI**

In the 1988 “Gross National Income” (GNI) was introduced as the fourth own resource, and was originally based on “Gross National Product” (GNP). This resource was meant to replace the VAT resource as a way of balancing the budget. The same decision of 24 June 1988 set the ceiling for the total own resources. In 1988 this was 1.14% of GNP while in 1999 it rose to 1.27%. The

decision of 2000 extended the application of the European system of economic accounting introduced in 1995 (ESA 95) to the EU budget. In ESA 95 gross national product (GNP) was replaced by the concept of gross national income (GNI). The new decision thus used GNI for the determination of the own resources instead of GNP. In order not to touch the amount of financial resources made available to the Communities the ceiling for the own resources as a percentage of the GNI of the EU was adjusted. The new ceiling is 1.24% of the GNI of the EU, which was confirmed in the decision of 2007 on the own resources.

The GNI resources are the result of the application of a specific percentage, determined every year as part of the budgetary procedure, to an assessment base that is the sum of the gross national income of the member states at market prices. They are equal to the difference between the expenditure and the sum of all the other budget resources. They play a key role because they finance not only the greater part of the budget but also determine the ceiling of the assessment base of the VAT, the distribution of the financing of the UK rebate and the maximum amount of the entirety of resources that the Community is allowed to collect.

The own resources are made available by the member states to the Community every month and paid to the “own resources” account of the Commission, which in principle is kept with the central bank of the member state. The traditional own resources are credited as they are collected. The VAT and the GNI resources are made available to the Commission on the first working day of each month. The monthly amount made available is one twelfth the amount estimated in the budget. Nonetheless the member states may, in connection with specific requirements relating to the payment of agricultural expenditure, be requested to pay the sums provided for in the context of the VAT and GNI resources one or two months earlier during the course of the first quarter.

#### **D. Comparison**

From the figures given below it will be seen that the importance of the own resources system (TOR and VAT) has declined significantly relative to total revenues.

This declining share in respect of the traditional own resources (agricultural levies, customs duties and sugar levy) is related to the growing freedom of world trade and the associated policy of lower import duties.

The lower share of VAT revenue has to do with the maximum percentage of 1.4 % imposed in 1985 and which now has been reduced to the current 0.3% for most member states.

Over the last twenty years the importance of the GNI resources has grown uninterrupted.

**Table I: Percentage of the budget**

	1988	1990	1995	2000	2005	2012
Sugar levies & Customs duties	28.5	26.1	19.3	15.3	11.3	14.95
VAT resources	57.2	59.1	52.2	38.1	14.0	11.23
GNP/GNI resources	10.6	0.2	18.9	42.3	73.8	72.60
Miscellaneous – Balance past year	3.7	14.6	9.7	4.3	0.9	1.22
Total	100	100	100	100	100	100

The intention of the 1970 treaty to introduce a system of own resources has been allowed to decline by the present system, which is again based on national contributions.

#### **II. The UK rebate and other reductions**

The first rebate in favour of the United Kingdom was made under the agreement of June 1984.

The question of the “fair return” is related to the discussion about net contributors. This subject returned to the negotiating table of the European Council during the negotiations about the 2007-2013 financial contexts.

The correction mechanism in favour of the United Kingdom was upheld in the 2007 Council decision concerning the own resources. This means that a modification is only possible if all the member states are in favour, which gives the United Kingdom a de facto veto. Under the current financial system three kinds of reduction are possible.

First of all, the UK is reimbursed for 66% of the difference between its contribution and what is received back from the budget. The calculation is based on its GNI and VAT.

In the 2013 budget this rebate is worth 4.6 billion euros. The own resources system now in effect makes the rebate in favour of the UK less attractive than it was in previous versions of the system.

The cost of the UK rebate is shared among the other EU member states in proportion to the share they contribute to the GNI of the EU.

However, since 2002 this has been limited to 25% of its normal value for Germany, the Netherlands, Austria and Sweden. In effect Germany's share of the UK rebate has reduced from 24.6% to 6.1%, the Netherlands' share from 5.4% to 1.4%, Austria's share from 2.8% to 0.7% and Sweden's share from 3.9% to 0.9%

As a result the cost of this reduction in the contribution by these four member states to the UK's rebate is divided among the other 22 countries. The net effect is that the UK's rebate is paid - in order of importance - by the following five states: France (26.9%), Italy (20%), Spain (13.2%), Germany (6.1%) and Belgium (4.9%).

Apart from the UK rebate, the financing system allows a lump-sum payment to the Netherlands and Sweden. This reduction is shared among the other 25 states in proportion to their share in GNI. For 2013 these payments came to 653 million euro for the Netherlands and 143 million Euros for Sweden.

A third reduction concerns a reduction of the VAT own resources. The financial system provides for a VAT rate of 0.300%. The VAT contribution of Austria, however, is 0.225% (worth 108 million euros), whereas Germany contributes VAT only at a rate of 0.150% (worth 1.7 billion euros), the Netherlands contributes only 0.100% (worth 518 million euros) or a third of the rate paid by other members, while Sweden benefits from the same reduction as the Netherlands (worth 380 million euros in 2012).

The cost to the budget of all these reductions adds up to several billion euros as follows:

- UK rebate: 4.6 billion
- VAT reductions for four states: 2.8 billion
- GNI reduction for two states: 796 million

The total cost of these reductions to the finance available to the EU budget is therefore 8.1 billion euros.

### **III. The 2013 EU budget**

The 2013 budget (sixth adapted) of the European Union sets the revenues at 140.5 billion Euros. The own resources are 136.4 billion euros and the 4.1 billion euro difference is related to the tax income derived from the salaries of the EU's civil servants, the surplus on the previous budget, fines, etc.

---

<sup>3</sup> Sixth adapted budget 2013 from 24 October 2013, in: Official Journal edition: L no. 6, 10 January 2014.

The own resources are as follows.

In 2013 the TOR (traditional own resources) came to 14.8 billion euros. The largest contributors are: Germany (3 billion), United Kingdom (2.3 billion), Italy (2.2 billion) , the Netherlands (1.7 billion), France (1.5 billion) and Belgium (1.3 billion).

The large contributions made by Belgium and the Netherlands can be explained by the size of their ports (e.g., Antwerp, Rotterdam, and Zeebrugge) and their cargo-handling airports (e.g. Schiphol and Zaventem).

In 2013 VAT revenues came to 14.7 billion. The largest contributors of VAT revenue are the following: France (2.8 billion), UK (2.8 billion), Italy (1.9 billion), Germany (1.7 billion) and Spain (1.3 billion). This is after the application of the reduction for the four states mentioned above. Even though it enjoys a 50% reduction, Germany still comes out as the fourth largest supplier of VAT finance.

The GNI contribution accounted for revenues of 106.9 billion euros in the 2013 budget. The five largest contributors are Germany (22.3 billion), France (17 billion), UK (15.9 billion), Italy (12.6 billion) and Spain (8,4 billion). If it did not receive a rebate the UK would make a contribution between that of Italy and Spain.

#### **IV. Calculations**

The following table gives an overview of the ranking of the member states by per capita contribution (in euros) to the budgets for the years 2006 and 2013.

Bulgaria and Romania were not member states in 2006 and Croatia has been member only since 1 July 2013.

**Table: II Per capita contribution in 2006**

1.	Luxembourg	535
2.	Denmark	355
3.	Ireland	327
4.	Sweden	290
5.	Belgium	276
6.	France	274
7.	The Netherlands	260
8.	Austria	259
9.	Finland	258
10.	Germany	236
11.	Italy	230
12.	Spain	198
13.	United Kingdom	179
14.	Cyprus	172
15.	Greece	162
16.	Slovenia	139
17.	Portugal	129
18.	Malta	108
19.	Czech Republic	92
20.	Hungary	84
21.	Estonia	69
22.	Slovakia	67
23.	Poland	60

24.	Lithuania	58
25.	Latvia	52

Source: EU budget figures and population figures from the CIA World Factbook

The financial crisis had to yet to strike in 2006 and the Benelux and Scandinavian states were the largest per capita contributors to the EU budget along with France and Germany. The member states joining the EU since 2006 are all smaller contributors. With the exception of Cyprus all the new member states joining in 2006 made a smaller contribution than the 15 existing member states (apart from Portugal). It may be recalled that the EU expanded to 15 in 1995.

The contributions of Luxembourg and Latvia differed by a factor of 10.28!

**Table III - Per capita contribution in 2013**

1.	Luxembourg	677
2.	Denmark	505
3.	Belgium	502
4.	Sweden	423
5.	Finland	412
6.	The Netherlands	380
7.	Austria	380
8.	France	345
9.	Germany	341
10.	Ireland	326
11.	Italy	276
12.	United Kingdom	263
13.	Spain	241
14.	Slovenia	207
15.	Malta	186
16.	Greece	176
17.	Portugal	161
18.	Estonia	156
19.	Cyprus	154
20.	Czech Republic	153
21.	Slovakia	147
22.	Latvia	116
23.	Poland	113
24.	Lithuania	109
25.	Hungary	104
26.	Romania	69
27.	Bulgaria	65
28.	Croatia	53

Source: EU budget figures and population figures from the CIA World Factbook

It is noteworthy that the two countries (i.e. Belgium and Luxembourg) that are home to the great majority of European institutions were among the top five per capita contributors in 2006 and the top three contributors in 2013.

What is also worth remarking is that the 21st century expansion of the Community to include ten Southern and Eastern European countries in 2004 and the 2007 expansion with Romania and Bulgaria cannot be regarded as a financial success for the EU budget.



The Republic of Cyprus is the only member state in the 2006 ranking which had a higher per capita ranking than an existing member and in the 2013 ranking this applies to only Slovenia and Malta.

Furthermore, the 2013 ranking shows that the 15 member states in 1995 still lead the contributions table with the minor exception of Portugal and Greece.

The Luxemburg and Bulgarian per capita contributions differ by a factor 10.41 (In 2013 Croatia contributed to the budget for only six months).

The most recent arrivals are well down in the list of per capita contributions.

When we compare the relative positions of the member states in 2006 and 2013 we see that Ireland and Cyprus now make lower per capita contributions as a result of the financial crisis. With respect to this latter, we see Ireland slipping back from 3rd place in 2006 to a 10th place in 2013.

Even after the reductions enjoyed by Austria, Germany, the Netherlands and Sweden these four countries remain among the top ten.

The largest contributors continue to be the three Benelux countries, the three Scandinavian members, Germany, France, Austria and Ireland.

The EU general budget may also be used to determine the overall share of the member states in the financing of the budget (TOR, VAT and GNI).

The following table ranks the member states by their percentage contribution to EU budget between 2002 (15 members) and 2012 (27 members).

**TABLE: IV Ranking of Member States by % Contribution to the EU Budget**

	2002	2006	2010	2012
Germany	24.44 % (1)	20.56 % (1)	19.53 % (1)	19.95 % (1)
France	16.72 %	16.43 % (2)	16.73 % (2)	16.37 % (2)
United Kingdom	14.27 %	12.38 % (4)	10.87 % (4)	11.61 % (4)
Italy	13.03 %	13.69 % (3)	13.34 % (3)	12.89 % (3)
Spain	7.73 %	8.93 % (5)	9.33 % (5)	8.87 % (5)
the Netherlands	6.48 %	5.20 % (6)	5.03 % (6)	4.99 % (6)
Belgium	3.97 %	4.01 % (7)	4.02 % (7)	4.11 % (7)
Sweden	2.73 %	2.72 % (8)	2.28 % (9)	2.77 % (9)
Austria	2.47 %	2.15 % (11)	2.19 % (10)	2.12 % (10)
Denmark	1.97 %	2.09 % (12)	2.17 % (11)	2.04 % (11)
Greece	1.63 %	2.20 % (10)	2.15 % (12)	1.73 % (12)
Portugal	1.46 %	1.36 % (15)	1.37 % (14)	1.29 % (14)
Finland	1.45 %	1.48 % (13)	1.58 % (13)	1.56 % (13)
Ireland	1.40 %	1.38 % (14)	1.25 % (15)	1.25 % (15)
Luxembourg	0.25 %	0.24 % (20)	0.25 % (22)	0.25 % (23)
Poland	-	2.34 % (9)	2.64 % (8)	3.18 % (8)
Czech Republic	-	1.02 % (16)	1.23 % (16)	1.08 % (16)
Slovakia	-	0.38 % (18)	0.66 % (19)	0.60 % (18)
Hungary	-	0.91 % (17)	0.76 % (18)	0.86 % (19)
Slovenia	-	0.29 % (19)	0.36 % (20)	0.33 % (20)
Lithuania	-	0.22 % (21)	0.25 % (23)	0.26 % (21)
Latvia	-	0.13 % (23)	0.15 % (25)	0.15 % (25)
Estonia	-	0.10 % (24)	0.13 % (26)	0.13 % (26)
Cyprus	-	0.16 % (22)	0.18 % (24)	0.16 % (24)

Malta	-	0.05 % (25)	0.06 % (27)	0.06 % (27)
Romania	-	-	1.15 % (17)	1.07 % (17)
Bulgaria	-	-	0.34 % (21)	0.32 % (21)

Germany was and still is the greatest contributor to the Union. Even so Germany's contribution has fallen as a result of the EU's expansion and the correction in favour of the Federal Republic. As a result the difference with France has been reduced, with the latter's contribution remaining at its historic level.

The "juste retour" (fair return) principle works in favour of the British treasury and the UK has been a smaller contributor than Italy since the mid-2000s. This country's contribution has remained steady over the years, although here again we see the impact of the financial crisis. The same remark can be made for Spain.

If we group these countries by date of accession we are struck by the following facts:

- The six founder members still contribute 58.56 % of funding (figures 2012);
- The three member states that joined in 1973 contribute 14.73 % (2012);
- The southerly expansion of the eighties with the accession of Greece in 1981 and the two main countries of the Iberian peninsula (1986) accounts for 11.29 % (2012);
- The 1995 expansion, which saw the accession of Sweden, Finland and Austria, has in relative terms been financially favourable. These three member states provide 6.44% (2012) of all national contributions;

The conclusion is that the fifteen member states that acceded in the period from 1951 to 1995, still account for 91.62% (figures 2012) of the national contributions to the EU budget.

This makes it clear that the accession of the new members has certainly not brought any budgetary windfalls.

It also says much about the differences in prosperity between the former fifteen and the member states acceding to the EU in the new century.

Comparisons of the figures for 2008 and 2012 also highlight the impact of the economic recession and financial crisis, particularly the decline of the contributions to the EU budget of the "PIGS" countries.

The Eurozone states (17 members) finance the budget for 76.83% (2012).

Noteworthy is the 9.35% (2012) contribution of the Benelux, which is in excess of that of Spain. Comparison of the British contributions for 2008 and 2012 also show that the UK rebate became less attractive in this period.

When take account of the GDP of the EU and the national contributions by the member states we arrive at the following (figures for 2012):

**Countries which are contributing more than their GDP share**

France:	16.37 %	(G.D.P. = 14 %)	+ 2.37 %
Italy	12.89 %	(G.D.P. = 11.3 %)	+ 1.59 %
Belgium:	4.11 %	(G.D.P. = 2.6 %)	+ 1.51 %
Denmark:	2.04 %	(G.D.P. = 1.3 %)	+ 0.74 %
the Netherlands:	4.99 %	(G.D.P. = 4.3 %)	+ 0.69 %
Sweden:	2.77 %	(G.D.P. = 2.4 %)	+ 0.37 %
Finland:	1.56 %	(G.D.P. = 1.2 %)	+ 0.36 %
Spain:	8.87 %	(G.D.P. = 8.7 %)	+ 0.17 %
Germany:	19.95 %	(G.D.P. = 19.8 %)	+ 0.15 %

- (I) The situation for Ireland, Cyprus, Greece, Latvia, Malta, Slovenia, Estonia and Lithuania has remained virtually unchanged.

**(III) Countries contributing less than their GDP share**

United Kingdom	11.61 %	(G.D.P. = 14.5 %)	- 2.89 %
Poland	3.18 %	(G.D.P. = 4.9 %)	- 1.72 %
Romania	1.07 %	(G.D.P. = 1.7 %)	- 0.63 %
Czech Republic	1.08 %	(G.D.P. = 1.8 %)	- 0.72 %
Hungary	0.86 %	(G.D.P. = 1.2 %)	- 0.34 %
Bulgaria	0.32 %	(G.D.P. = 0.6 %)	- 0.28 %
Slovakia	0.60 %	(G.D.P. = 0.8 %)	- 0.20 %
Portugal	1.29 %	(G.D.P. = 1.5 %)	- 0.21 %
Austria	2.12 %	(G.D.P. = 2.3 %)	- 0.18 %

**V. Policy Problems**

The Commission's desire for more and new own resources for the EU budget puts the spotlight on a number of policy problems.

Obtaining more money for the Union at a time when most member states are being forced to slash national budgets is a politically perilous operation.

We must ask if it is realistic to seek more appropriations for all areas of the future budget with the exception of natural resources.

The communication of the Commission on the own resources of 29 June 2011 requests an amendment of the Council decision of June 2007.

That decision is based on Article 269 of the EC treaty.

In view of the fact that the TFEU came into effect on 1 December 2009, this article became Article 311 TFEU. The procedure continues to be that the council, after consulting the European Parliament, unanimously adopts a decision on the own resources system.

This means that new types of own resources or a change to the present system (e.g. a reduction of the GNI) is only possible when all the member states in the Council are in favour.

This situation gives de facto and de jure a veto to each member of the European Union.

The unanimity rule is standard in EU procedures for all fiscal matters.

Several states are not in favour of changing the present system, including the United Kingdom, because of its rebate, the existence of "corrections" for the Netherlands, Sweden, Austria and Germany, and so on.

The unanimity rule thus works against any rapid change to the present decision. Article 314 TFEU also requires the approval of the national Parliaments of the member states as required by their national ratification procedures.

Nevertheless in an international organization organized along quasi confederal lines the veto power of the members must be regarded as reasonable.

With respect to the Commission's request for a review of the own resources system, most states will object to making more money available for the European budget, which is reasonable at a time when these states are themselves reducing spending. It is politically impossible to ask the public to swallow major cuts in national public spending while at the same agreeing to make more money available for the European project.

The Commission's other idea of replacing the GNI system with VAT own resources would be acceptable if national budgets are not expected to hand over more money to the EU.

The EU budget exists to fund the common policies that member states have agreed ought to be pursued at EU level (e.g. agriculture). The budget is an expression of the solidarity between all states and regions. The budget furthermore finances interventions aimed at regulating certain difficulties in the internal market.

The present own resources system is nonetheless extremely complex with the GNI contributions largely replacing the own resources. The present system is not transparent, particularly with several states being allowed to apply corrections to the calculation of the VAT and the GNI, and the UK being singled out for a rebate.

A new system of own resources would require a simplification of the rules. The current funding rules have evolved not only in response to the need for more accountability on how public money is spent but also as an ad hoc response to specific problems.

Any new system must have a result clearly linked to the implementation of the EU 2020 strategy and meeting the objectives of same.

## **VI. New Member States?**

The states acceding to the EU during the first years of the 21st century have not been wealthy. All twelve new members are states with levels of prosperity lower than the EU average.

What would be beneficial to the EU budget would be the admission of new members with a high standard of living. The only two possibilities are the Kingdom of Norway and the Swiss Confederation.

Both these countries are currently members of the European Free Trade Association (EFTA) and both countries contribute to certain EU agencies and programmes. Norway via the European Economic Area (EEA) and Switzerland on a bilateral base with the Union.

Following the Porto treaty of 1992 on the EEA Norway pays annual grants on behalf of the new EU member states. The Swiss Confederation has likewise created budget grants for the new members.

Both countries finance various EEA activities and grants for the twelve member states who joined the EU in this century.

The financial cost to both countries is about 500 million euros a year, considerably cheaper than full membership of the union.

The conclusion is all too clear. EU membership would cost Norway and Switzerland considerably more than their membership of EFTA and the EEA.

The GDP of these two countries indicates that they would be contributors to the Union. Their accession would undoubtedly have an extremely positive impact on the EU budget, but holding out net contributor status is hardly likely to persuade either country to join the EU.

## **VII. Conclusion**

The 2007 own resources decision formalized the existing trend towards making the GNI contributions the main source of finance for the General Budget of the European Union.

For almost 40 years this budget has been compromised by the "fair return" principle, which works in favour of the United Kingdom.

In the meantime special arrangements have also been allowed for the Netherlands, Sweden, Austria and Germany.

All decisions on the own resources continues to be subject to unanimous approval. This means that each member state must give its approval to any change. This is the challenge that must be overcome if any change is to be made.

Although the idea of raising a direct EU tax for funding the EU's budget was widely discussed in the 1970s and 1980s, it is now moribund.

The funding of the budget continues to rest very largely on the shoulders of the first 15 member states. The accession of the twelve new member states can hardly be regarded as a financial success.

The new proposal of the Commission is to return to the original idea of own resources. The VAT is an excellent means for financing the EU budget. A reduction of the GNI contribution and its replacement by a higher rate of VAT collection would be an implementation of the conclusions of the Fontainebleau European Council of 1984 and would automatically restrict the contributions of those member states who would otherwise face a budgetary burden disproportionate to their relative prosperity.

Europe needs a new fairer and more transparent system. Since the 1970 Luxembourg agreement the Union has done nothing regarding the use of VAT for own resources. VAT is related to the welfare of member states and a fixed percentage of this indirect tax could be set aside as part of a long-term financial plan for the funding of the general EU budget.

The EU budget is necessary and has a pan-European rather than a national rationale. Its comparatively small size allows it to be concentrated where it delivers high added value for the EU.

The budget does not seek to fund interventions that member states could finance by themselves.

Even so the Commission's request for more financial revenues is controversial at this time of strict budgetary discipline.

Indeed it is the EU that is asking member states to put an end to budget deficits at the very latest in 2016. Even in 2012, the European Union stipulated that member states should not have a public finance deficit of more than 3% of national GDP.

So ultimately it comes down to the following question: are the member states prepared to return to the own resources system and an associated increase in revenues at a time when nearly all member states are having to implement strict budgetary discipline.

It is the European Council that has to take the decision, but member states like the UK, France, Germany, the Netherlands and Finland do not support the Commission's request for more financial resources. Indicative is that Denmark expressed its opposition to the Commission's request for a greater contribution to the budget as long ago as November 2012.

The existing own resources system is overly complicated and greater transparency is desperately required.

One of the greatest problems are the time period and policies of the MFF system, which were designed to rein in spending on agriculture and the fisheries.

Finally the European Union would undoubtedly benefit from the accession of prosperous new member states, but as any such countries would be net contributors future accession seems highly unlikely.

# Expression of Acetylcholinesterase after neuronal-differentiation NG108-15 cells

---

**Prawpan S.,**

*Department of Cardio-Thoracic Technology, Faculty of Allied Health Sciences, Naresuan University, Phitsanulok, 65000 Thailand.*

**Sukkid Y.**

*Department of Biochemistry, Faculty of Medical Sciences, Naresuan University, Phitsanulok, 65000 Thailand.*

*This study was supported by Division of Research Administration, Naresuan University.*

## **Abstract**

Currently treatment for Alzheimer's disease (AD) focused on enhancing Acetylcholine (ACh) level by using Acetylcholinesterase (AChE) inhibitors. The NG108-15 cell is a neuronal cell line. Differentiation of NG108-15 cell exhibited neuron-like shape and high expression of AChE mRNA. In contrast, undifferentiated NG108-15 cell showed non-neuron like cells. This study aims to compare the expression of AChE protein and enzyme activity in differentiated and undifferentiated NG108-15 cells. The NG108-15 cells as undifferentiated cells were cultured for 3 days. Dibutyl cAMP and 12-o-tetradecanoyl-phorbol 13-acetate were added to the culture medium for neuronal differentiation. The expression of AChE protein was determined by western blot. The level of AChE enzyme activity was performed by Ellman's method. The results showed that the AChE protein in differentiated cells at day 2 and 3 tended to be higher than the undifferentiated cells at the same day but the expression level was not different. The AChE enzyme activity in differentiated NG108-15 cells at day 2 and 3 was significantly higher than in undifferentiated cells at the same day. In conclusions, the AChE protein and enzyme activity in NG108-15 cells were changed after differentiation during 3 days incubation period. This in vitro model may be useful as a primary screening tool for AChE inhibitors in potential AD therapeutic agents.

**Key words:** Acetylcholinesterase, protein, enzyme activity, NG108-15 cells

## Introduction

Acetylcholinesterase (AChE) is the enzyme that hydrolyses the neurotransmitter Acetylcholine (ACh). AChE is found at the brain cholinergic synapses and neuromuscular junctions. The function of AChE in the brain is related to neuronal development and synapse formation. Several studies reported that deficit in the cholinergic neurotransmitter is involved in cognitive impairment in Alzheimer's disease (AD) (Gil-Bea, García-Alloza, Domínguez, Marcos & Ramírez, 2005; Vogel et al., 1990; Tohgi, Abe, Hashiguchi, Saheki & Takahashi, 1994; Rees, Hammond, Soreq, Younkin & Brimijoin, 2003). An autopsy of AD brains revealed that the reduction of the ACh, Choline acetyl transferase (ChAT), and AChE levels compared to normal brains (Gil-Bea et al., 2005). Neuronal atrophy is associated with the loss of cholinergic markers in the nuclear basalis of Meynert and hippocampus (Vogel et al., 1990). There are also significant reductions of ChAT and ACh in cerebrospinal fluid, correlating with mental status scores (Tohgi et al., 1994). Moreover, it has been reported that AChE promotes aggregation of  $\beta$ -amyloid plaques in cerebral cortex of AD brains (Rees et al., 2003).

The NG108-15 cell is a hybrid cell line of mouse neuroblastoma (N18TG-2) and rat glioma (C6BU-1) (Tohda & Nomura, 1988). This cell line has been widely used to study in physiology, pharmacology, and anatomical of neuronal function and features because of the ease controlling and culturing, and all cells showed simultaneous differentiation in the same culture dishes. The neuronal properties of the NG108-15 cells were reported such as synapse formation was presence when NG108-15 cells and striated muscle cells were co-cultured (Nelson, Christian & Nirenberg, 1976). The synthesis, storage and excretion of ACh were detected at synapse formation (Nelson et al., 1976). The NG108-15 cells were able to express and secrete exogenous AChE when they were transfected with cDNA encoding chick AChE (Choi, Yam, Hui, Wan & Tsim, 1998). The expression of neuronal protein such as ChAT and AChE was positive in differentiated NG108-15 cells but was negative in undifferentiated cells (Tojima, Yamane, Takahashi & Ito, 2000). High expression of AChE mRNA was detected in differentiated NG108-15 cells by RT-PCR analysis (Suwanakitch, Jeenapongsa, Watanabe & Saelim, 2008). Therefore, it was hypothesized whether the NG108-15 cells could be used as in vitro model for studying AChE expression. The morphology differences between differentiated and undifferentiated NG108-15 cells were compared. Undifferentiated NG108-15 cells showed primary-cultured non-neuron like cells. The undifferentiated NG108-15 cells exhibited round in shape and appear a few neurites (Tohda, Kumagai & Nomura, 1991). Neuronal differentiation of NG108-15 cells was clearly seen when adding Bt2cAMP and TPA in the culture medium (Tohda et al., 1991). Differentiated NG108-15 cells exhibited neuron-like morphology, large numbers of neurites and neuritic varicosities (Tohda et al., 1991). Thus, this study aimed to compare the expression of AChE protein and AChE enzyme activity in differentiated and undifferentiated NG108-15 cells.

## Materials and Methods:

### 2.1 Reagents

Bt2cAMP and TPA were purchased from Sigma Chemical Co. (St Louis, MO, USA). All other chemicals used were in the purest form available commercially.

### 2.2 Cell Culture and Differentiation Induction

NG108-15 cells (ATCC® number HB-12317) were cultured in Dulbecco's Modified Eagle Medium (DMEM) (Gibco BRL, Gaithersburg, MD) supplemented with 2% HAT supplement (10 mM hypoxanthine, 40 mM aminopterin, 1.6 mM thymidine; Gibco/Life Technologies, Eggenstein, Germany), and 4% FBS (Invitrogen, California, USA). Cells were incubated in humidified incubator with 5% CO<sub>2</sub> at 37°C. To induce neuronal differentiation, the culture medium

was adding with 100 mM dibutyryl cAMP (Bt2cAMP) and 100  $\mu$ M 12-o-tetradecanoyl-phorbol 13-acetate (TPA). The differentiation and undifferentiation NG108-15 cells were cultured for 3 days (Tohda et al., 1991).

### 2.3 Western Blot Analysis

Protein from the NG108-15 cells was extracted in ice-cold RIPA buffer. Protein content was determined by using Quant-iT™ protein assay kit (Invitrogen, California, USA). For Western blot analysis, 20  $\mu$ g of protein was separated on 10% SDS-PAGE. Protein in SDS-PAGE was transferred to PVDF membrane (Amersham Biosciences, New Jersey, USA). The membranes were blocked with 8% milk in TBST buffer before incubating with primary rabbit anti-mouse AChE polyclonal antibodies (Santa Cruz Biotechnology, Inc., Santa Cruz, CA) at concentration of 1:300 for 3 hours at 25°C. The membranes were incubated with secondary goat anti-rabbit IgG antibodies (Santa Cruz Biotechnology, Inc., Santa Cruz, CA) at concentration of 1:10,000 for 1 hour at 25°C. To normalize the protein loading, membrane was blotted with GAPDH antibody to produce a molecular mass of about 36 kDa. The interested proteins were detected using ECL method (Amersham Biosciences, New Jersey, USA) and quantified by using ImageJ.

### 2.4 Acetylcholinesterase (Ache) Microassay

The NG108-15 cells were lysed in ice-cold RIPA buffer. The homogenate was centrifuged for 10 min at 3,000 g at 4°C and resulting supernatant was used for AChE enzyme activity determination. The measurement of AChE enzyme activity in NG108-15 cells was modified from the method of Ellman et al. (1961). The assay was performed in 96-well plates by adding 260  $\mu$ l of 50 mM PBS (pH 8), 10  $\mu$ l of 30 mM Acetylthiocholine-iodide (ATCI), 10  $\mu$ l of 10 mM 5,5'-dithiobis-(2 nitrobenzoic acid) (DTNB), and 20  $\mu$ l of AChE enzyme, respectively. The absorbance was measured by using the microplate reader at a wavelength of 405 nm. AChE enzyme activity was calculated using following formula: where R is the rate of enzyme activity (expressed as nmol of acetylcholine iodide hydrolyzed/min/10<sup>5</sup> cells).  $\Delta$ OD is the change in absorbance per minute and E is the extinction coefficient, which is 13,600 M<sup>-1</sup>cm<sup>-1</sup>.

$$R = \frac{\Delta OD \times \text{volume of assay (300 } \mu\text{l)}}{E \times 10^5 \text{ cells}}$$

### 2.5 Statistical Analysis

All data are presented as mean + SEM. Statistical testing used analysis of variance followed by a post-hoc LSD test and unpaired t - test. The criterion for statistical significance was P<0.05 for all comparisons.

## Results:

### 3.1 Morphological Between Undifferentiated and Differentiated Ng108-15 Cells

After culture for 3 days, the morphological characteristics of undifferentiated and differentiated NG108-15 cells were observed under photomicrographs. The undifferentiated NG108-15 cells were round in shape and displayed only a few neurites as shown in figure 1 (A). After exposure to Bt2cAMP and TPA, the differentiated NG108-15 cells exhibited neuron-like morphology as shown in figure 1 (B).



### **3.2 Ache Protein Expression in Differentiated and Undifferentiated Ng108-15 Cells**

The AChE protein expressions were statistically measured as shown in (Figure 2). GAPDH was used as an internal control as shown in figure 2(A). The AChE protein in differentiated cells at day 2 and 3 tended to be higher than the undifferentiated cells at the same day but the expression level was not different as shown in figure 2(B).

### **3.3 Ache Enzyme Activity in Differentiated and Undifferentiated Ng108-15 Cells**

The AChE enzyme activity in differentiated NG108-15 cells at day 2 and 3 was significantly higher than in undifferentiated cells at the same day ( $p < 0.01$ ) and differentiated cells at day 1 ( $p < 0.01$ ). Compared to undifferentiated cells, the AChE enzyme activity at day 3 was significantly greater than day 1 and 2 ( $p < 0.01$ ) as shown in figure 3.

### **Discussion:**

The expression of AChE protein was investigated. The results showed that the level of AChE protein in differentiated NG108-15 cells at day 2 and 3 tended to be greater than the undifferentiated cells at the same day but the expression level was not different. The same result was shown in Tojima study that the AChE protein expression in differentiated NG108-15 cells was higher than the undifferentiated cells (Tojima et al., 2000). In contrast, the culture period for differentiation NG108-15 cells in Tojima study (8 days) was longer than this study only 3 days.

The AChE enzyme activity was also studied. The results showed that the AChE enzyme activity in differentiated NG108-15 cells at day 2 and 3 was significantly greater than undifferentiated cells at the same day. The same result was found in Curtin et al. study. Curtin et al. demonstrated the AChE enzyme activity by using mouse neuroblastoma cell line Neuro 2A (Curtin, Pal, Gordon & Nambiar, 2006). Recent treatment for AD has been focused on enhancing cholinergic function by using AChE inhibitors. It has been reported that elevation of ACh by inhibiting AChE activity to improve the cognitive deficits in AD patients (Passmore, Bayer & Steinhagen-Thiessen, 2005). Therefore, it could be suggested that this differentiated NG108-15 cell line may be utilized as a tool for screening agents that inhibit the expression of AChE protein and AChE enzyme activity.

### **Conclusion**

Differentiation induction of NG108-15 cells by Bt2cAMP and TPA after culture for 3 days resulted in the up-regulation of AChE protein and enzyme activity.

### **Acknowledgement**

This study was supported by Division of Research Administration, Naresuan University.

## References

- Choi, R.C.Y., Siow, N.L., Cheng, A.W.M., Ling, K.K.Y., Tung, E.K.K., Simon, J., et al. (2003). ATP acts via P2Y<sub>1</sub> receptors to stimulate acetylcholinesterase and acetylcholine receptor expression: transduction and transcription control. *J Neurosci* 23(11):4445-56.
- Choi, R.C.Y., Yam, S.C.Y., Hui, B., Wan, D.C.C., & Tsim, K.W.K. (1998). Over-expression of acetylcholinesterase stimulates the expression of agrin in NG108-15 cells. *Neurosci Lett* 248:17-20.
- Curtin, B.F., Pal, N., Gordon, R.K., & Nambiar, M.P. (2006). Forskolin, an inducer of cAMP, up-regulates acetylcholinesterase expression and protects against organophosphate exposure in neuro 2A cells. *Mol Cell Biochem* 290:23-32. doi: 10.1007/s11010-005-9084-4
- Ellman, G.L., Courtney, K.D., Andres, V., & Featherstone, R.M. (1961). A new and rapid colorimetric determination of acetylcholinesterase activity. *Biochem Pharm* 7:88-95.
- Gil-Bea, F.J., García-Alloza, M., Domínguez, J., Marcos, B., & Ramírez, M.J. (2005). Evaluation of cholinergic markers in Alzheimer's disease and in a model of cholinergic deficit. *Neurosci Lett* 375(1):37-41. doi:10.1016/j.neulet.2004.10.062
- Nelson, P., Christian, C., & Nirenberg, M. (1976). Synapse formation between clonal neuroblastoma x glioma hybrid cells and striated muscle cells. *Proc Natl Acad Sci USA* 73:123-127.
- Passmore, A.P., Bayer, A.J. & Steinhagen-Thiessen, E. (2005). Cognitive, global and functional benefits of donepezil in Alzheimer's disease and vascular dementia: results from large-scale clinical trials. *J Neurol sci* 229-230:141-6.
- Rees, T., Hammond, P.I., Soreq, H., Younkin, S., & Brimijoin, S. (2003). Acetylcholinesterase Promotes beta-amyloid plaques in cerebral cortex. *Neurobiol Aging* 24(6):777-787. doi:10.1016/S0197-4580(02)00230-0
- Suwanakitch, P., Jeenapongsa, R., Watanabe, H., & Saelim, N. (2008). Comparison of Alzheimer Disease-related gene expression in differentiated and undifferentiated NG108-15 Cells. *ScienceAsia* 34:035-042. doi: 10.2306/scienceasia1513-1874.2008.34.035
- Tohda, M., & Nomura Y. (1988). Neurochemical and morphological studies on Differentiation of NG108-15 cells by phorbol ester and forskolin. *Neurochem Int* 13(1):37-42.
- Tohda, M., Kumagai, C., & Nomura, Y. (1991). Effect of the simultaneous application of Dibutyryl cAMP and phorbol ester on morphological differentiation in NG108-15 cells. *Neurochem Int* 19(3):255-260.
- Tohgi, H., Abe, T., Hashiguchi, K., Saheki, M., & Takahashi, S. (1994). Remarkable reduction in acetylcholine concentration in the cerebrospinal fluid from patients with Alzheimer's type dementia. *Neurosci Lett* 177(1-2):139-142.
- Tojima, T., Yamane, Y., Takahashi, M., & Ito, E. (2000). Acquisition of neuronal proteins during differentiation of NG108-15 cells. *Neurosci Res* 37(2):153-161.

- Tojima, T., & Ito, E. (2004). Signal transduction cascades underlying de novo protein synthesis required for neuronal morphogenesis in differentiating neurons. *Prog Neurobiol* 72(3):183-93. doi:10.1016/j.pneurobio.2004.03.002
- Vogel, O.J.M., Broere, C.A.J., Laak, H.J.T., Donkelaar, H.J.T., Nieuwenhuys, R., & Schulte, BPM. (1990). Cell loss and shrinkage in the nucleus basalis Meynert complex in Alzheimer's disease. *Neurobiol Aging* 11(1):3-13.
- Yu, X., Luo, A., Zhou, C., Ding, F., Wu, M., Zhan, Q., et al. (2006). Differentiation-associated genes regulated by TPA-induced c-Jun expression via a PKC/JNK pathway in KYSE450 cells. *Biochem Biophys Res Commun* 342(1):286-92. doi:10.1016/j.bbrc.2006.01.147

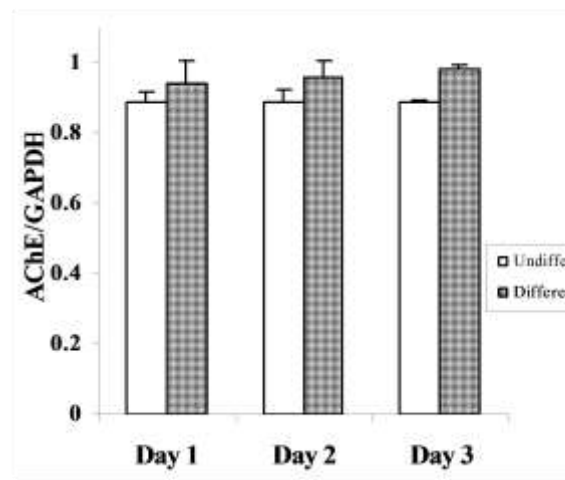
**Undifferentiated NG108-15 cells**



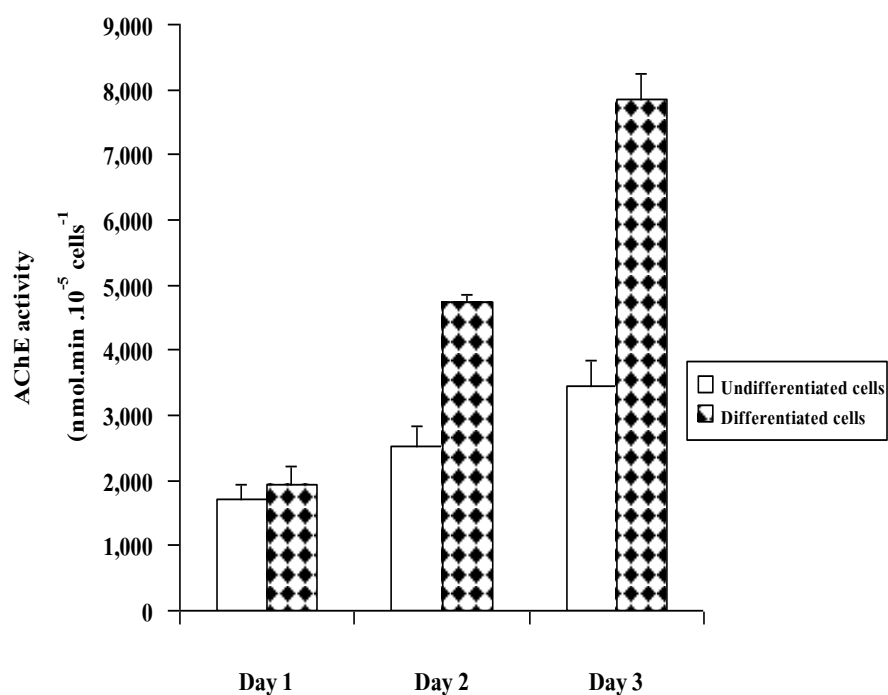
**Differentiated NG108-15 cells**



**Figure 1:** Morphology of NG108-15 cells after being cultured for 3 days.



**Figure 2:** AChE protein expression in differentiated and undifferentiated NG108-15 cells after being cultured for 1, 2 and 3 days. Data were present in Mean  $\pm$  SEM, n = 3.



**Figure 3:** AChE enzyme activity in differentiated and undifferentiated NG108-15 cells after being cultured for 1, 2 and 3 days. Data were present in Mean  $\pm$  SEM, n = 3.

**Note:** \*\*P $\leq$ 0.01 vs. undifferentiated NG108-15 cells at day 1  
##P $\leq$ 0.01 vs. differentiated NG108-15 cells at day 1

# Effectiveness of Non-Governmental Organisations in Poverty Reduction in Kasena-Nankana and Builsa Districts in North-Eastern Ghana

---

**Kanlisi Kaba Simon**

*Department of Planning and Management, Faculty of Planning and Land Management  
University for Development Studies, Tamale, Ghana.*

[simonkanlisi@yahoo.com](mailto:simonkanlisi@yahoo.com) , [skanlisi@uds.edu.gh](mailto:skanlisi@uds.edu.gh)

**Arkum Thaddeus Aasoglenang,**

*Department of Community Development, Faculty of Planning and Land Management,  
University for Development Studies, Tamale, Ghana.*

[aasogthad@yahoo.com](mailto:aasogthad@yahoo.com), [athaddeus@uds.edu.gh](mailto:athaddeus@uds.edu.gh)

## **Abstract**

Governments in the world particularly those in Africa and Ghana have been challenged by global socio-economic changes that made it difficult for them to provide adequate support for their peoples. For some time now, NGOs have stepped in to complement Government efforts in reducing poverty. However, in spite of an increase in the number of NGOs, the incidence of poverty still remains high in the Upper East Region of Ghana especially in the Kasena-Nankana and Builsa Districts. The aim of this study was therefore to find out how effectively the strategies of NGOs in the two Districts are contributing to poverty reduction. The survey research tools included household questionnaire administration, interviews, focus group discussions, direct observation and a review of related literature. The findings suggested that the strategies of NGOs have not had any significant positive effect on poverty reduction in the Kasena-Nankana and Builsa Districts. This is because of low level of investment by NGOs in the area, poor networking, advocacy, accountability and community empowerment as well as low collaboration between the District Assemblies and the NGOs. It was however noted that communities' commitment to participate in the development process in the two districts was encouraging once they were given the opportunity to engage the District Assemblies. The communities were found to be very weak at monitoring projects being implemented in their areas. The study however confirmed that poverty is still a serious constraining factor in the lives of the people. Their description of the poverty phenomenon differed from the elitist views of the NGOs and District Assembly staff. Discussions with focus groups indicated that District Assemblies and NGOs have not targeted the poor appropriately and this is one other reason why remarkable poverty reduction in the area has not been achieved.

**Key Words** – Effectiveness, Non-Governmental Organization, Poverty Reduction, Ghana.

## Background

The African continent is in the midst of many complex challenges. These challenges include , wars and conflicts, the search for appropriate processes and institutions of governance, increased poverty and devastating impact of HIV/AIDS. Others are declining external aid and investments. These challenges which impacted adversely on social and economic development in Sub-Saharan Africa resulted in the emergence and multiplication of civil society organizations, particularly Non-Governmental Organizations (NGOs) whose primary aim is to beef up support for poverty reduction. In Ghana, poverty and its various dimensions are precarious with four out of the ten regions being the hardest hit. Poverty in the country has largely been a rural phenomenon. For example, in 1999, the urban poor constituted only 17.3% as compared to 36% for rural areas. The phenomenon is very common among food crop farmers, 59% of whom are poor (Republic of Ghana, 1999).

According to Chambers (1989), causes of poverty in Ghana can be attributed to nine factors including inappropriate policies and institutional arrangements which do not favour the poor, such as the small expenditure on grassroots social protection, production and productivity. Another factor is high fertility and rapid population growth. Ghana's total fertility is 4.5 children per woman while the inter-censal population growth rate is 2.7%, which is above the average rates for the world (1.5%) and Less Developed Countries, which is 2.0% (Republic of Ghana, 2002). The rest of the factors are environmental degradation in rural areas and cultural norms against women development. For example, even though females form 51% of Ghana's population, 41% of them never attended school as compared to 21% of males while 63% of males are literate as compared to only 36% of females. Also, of the 55% of the population in agriculture, women constitute 45%. This shows the dismal situation of women development in Ghana (Republic of Ghana, 1999). Harsh tropical weather conditions, low productivity and income levels, illiteracy and low level of productive skills, globalization of the world economy as well as the structural adjustment and economic recovery programmes that brought hardship to the people as well as a history of political instability are other factors of poverty in Ghana.

In spite of Government efforts towards poverty reduction in Ghana, rural development continues to lag behind urban development resulting in the migration of rural people to the urban areas in search of a "better life". Government's realization that it cannot surmount the problem alone due to financial constraints coupled with efforts at decentralizing development planning and implementation to the local level as well as existing market failures have all culminated into increased penetration of NGOs into the rural communities with various strategies (Kokor, 2001; Republic of Ghana, 1992).

The aim of most of these NGOs is to fill the gaps that have been created as a result of the inadequacies of the market and Government. Some of these gaps include inadequate funding of some basic services by Government, exploitation by elite and poor grassroots capacity to mobilize for development (Clark, 1991). According to Goodin (2004), because NGOs are motivationally and organizationally distinct, they are capable of doing many things that neither the state nor the market sectors can do reliably or well.

Even though it is estimated that there are about 3000 foreign and local NGOs operating in Ghana currently (South African Institute of International Affairs, 2004), the task of measuring their collective performance so as to determine the extent to which they are contributing to poverty reduction is a daunting one. This is because of the varied fields of operation that these organisations engage in and the absence of common performance indicators to measure progress (Cotter, 1988; Fisher, 1993).

Adu (2005), however, observes that enhancing the participation of NGOs, as part of Civil Society, in Government decision making and the development process requires them to be effective. Their participation will be further enhanced depending on the extent of their credibility,

accreditation, good governance, accountability and transparency in dealing with Government, donors and communities or beneficiary groups.

However, what remains a fact is the increasing incidence of poverty in various areas in the Country where some NGOs have operated and still continue to operate. Northern Ghana which is noted to be the poorest in the country accounts for a good number of NGOs in the Country. Our exploratory survey indicated that at the regional level, more than forty NGOs operated in the Upper East Region since the year 2000 while a total of twenty and fifteen of them operated in the Kasena-Nankana and Builsa Districts..

### **The Problem**

In spite of the fact that NGOs have an integral role to play in promoting good governance by acting as local voices of dissent and providing services that Government struggles to offer, they are sometimes taunted as ineffective, corrupt and lacking transparency. They are said to have more important motives other than complementing government efforts and supporting communities to meet their basic needs such as food, clothing, shelter, healthcare, education and self-determination (South African Institute of International Affairs, 2004; Gyimah-Boadi, 2003; Safo, 2003). It is noteworthy that there is very little literature based on empirical studies conducted to support the claims made above in the case of Ghana.

However, it is a fact that there has been a proliferation of NGOs specializing in various sectors of the development process in Ghana since the 1990s against the background of increasing democratization and decentralization. Also, the poverty situation of some of the very communities that the NGOs targeted continues to worsen. These are two clear indicators that something somewhere went wrong. The basis of this dismal development situation is arguably linked to the existing operational arrangements and relationships between NGOs, communities, civil society and District Assemblies.

It has been stated in the Ghana Poverty Reduction Strategy I that the Country's goal is sustainable equitable growth, accelerated poverty reduction and the protection of the vulnerable and excluded within a decentralized, democratic environment (Republic of Ghana, 2003). The Ghana Shared Growth and Development Agenda also highlighted the importance of poverty reduction and the need for the masses to actively participate in the development process and also obtain a fair share of the positive outcomes of national progress (Republic of Ghana, 2010). Drawing inference from these statements, the expectations of all stakeholders in the development process undoubtedly is very clear. However, where there are dysfunctional linkages between the key players, as may be the case in the Upper East Region, the attainment of the overall goal of the country may never be realised. This therefore makes the study relevant as it would examine the effectiveness of NGOs and the relationship between such organisations and their target communities as well as the role of District Assemblies and Civic Unions in promoting accelerated community development within the framework of District Development.

Despite the great number of NGO operatives in the Upper East Region, the poverty incidence in the Region remains high. In 1999 for example, 88% of the people were poor as compared to 40% of the population of the Country that were considered poor. The 1999 Ghana Living Standards Survey conducted by the Ghana Statistical Service indicated that poverty increased in the Region by 21% between 1991 and 1999 whereas the overall national situation improved by a reduction of 10% within the same period (GPRS, 2003). Even though the population below the lower poverty line declined to 60.1% whereas those below the upper poverty line was at 70% (Ghana Statistical Service, 2007), these are still considerably remarkable.

The Kasena-Nankana and Builsa geo-political areas of the Upper East Region, are experiencing a proliferation of Non Governmental Organisations (NGOs) yet the communities



continue to lag in terms of development. This problem could probably be partially traced to ineffective strategies of the NGOs whose interventions are expected to complement government efforts.

A situation of this nature as indicated above raises a number of pertinent questions including the following:

1. How effective are the strategies of NGOs in reducing poverty?
2. What roles do the District Assemblies play in fostering community and NGO relations, especially with regard to transparency and accountability of the various stakeholders in poverty reduction?

### **Research Methodology**

Using the survey method a preliminary reconnaissance survey was conducted to determine the extent of NGO penetration in the districts. Primary data was collected using a survey questionnaire from 45% of NGOs operating in the area that were purposively selected. Besides, another survey questionnaire was administered to 200 households that were simple randomly selected and covered in the survey. Staffs of the two District Assemblies were interviewed and Focus Group Discussions held with identifiable civil society groups. Additional information on sample selection is provided in appendix 4 and 5. Correlation and descriptive statistical tools were used for data analysis.

The profiles of the two districts are very relevant in this study because issues studied are put in the geographical context.

The study area comprise of the Builsa North and West, Kasena-Nankana Municipal and Kasena-Nankana West Districts of the Upper East Region of Ghana. The Builsa North and South districts have an area of 2,220 square kilometres located between longitudes 1° 05' and 1° 35' West and latitudes 10° 20' and 10° 50' North.

### **The Civil Society Sector**

The civil society sector which is sometimes referred to as the social economy, with its various membership including non-profit organizations, associations, co-operatives, mutual societies and foundations has been growing and its recognition as a formidable force in the world's development process is becoming increasingly widespread. However, if social justice is to become enshrined in all processes of development as a means of harnessing the human potential for the good of all, then it is important that due regard is paid to all stakeholders so that there can be co-operation with the aim of deriving synergy for holistic development. This is particularly relevant for Ghana where 40% of the population is poor and poverty is predominantly a rural phenomenon (Republic of Ghana, 2002). It is arguably true that the local level can best identify the appropriate strategies for reducing poverty. Therefore, it is important that the local level's capacity is built and incorporated into formal decision-making since they have a veritable potential that can be tapped for development (Lukkarinen, 2006).

The social economy, especially its NGO membership, is recognized as very effective in the mobilization of the local level for development as compared to the market and the public sector. According to Lukkarinen (2006), the role of the social sector extends beyond social mobilization to include employment generation and meeting local needs. This is normally the case in remote communities where the public sector and the market have not been able to penetrate. Besides, the local level easily associates itself with the social sector since both share similar ideals such as democratic governance based on the principles of subsidiarity and solidarity (Kokor, 2001).

Policy determines the environment and framework within which development takes place. The Ghana Poverty Reduction Strategy I (GPRS I), which is the Government's policy document on poverty reduction and rural development, recognizes the importance of collaboration between NGOs, community and the state towards the achievement of a good standard of living of the people. However, the extent to which such partnership indicated above would lead to poverty reduction depends on the kind of strategies that the NGO sector in particular devises. It also depends on how such strategies reflect conditions and aspirations at the local level as well as the enabling environment that Government creates to allow them to thrive (Republic of Ghana, 2003).

According to Adu (2005), even though Government-NGO relations in Ghana have improved from limited interaction and discord to greater engagement and accommodation within the past decade, some amount of mistrust still exists. For example, many NGOs are accused of malpractices that range from the making of private gain in the name of humanitarian work, duplication of efforts, waste of resources, non-cooperation with central and local government authorities, fraudulent claims of tax exemptions, exploitation of the ignorance of local communities among others.

However, through their interactions at all levels of governance, Government officials and NGO leaders and activists are acknowledging the complementary nature of their separate but related roles. They are also appreciating the importance of each other towards the achievement of the common national goal such as their shared aspirations and commitment to poverty reduction, human development and good democratic governance in the country.

This is an indication that there is a growing awareness of the need for Government and NGOs to work together notwithstanding the determination of each actor to protect and promote civil, political, economic, social and cultural rights, and perform duties fundamental to the establishment of a just and free society.

Just as the relationship between the state, NGOs and communities evolved from a state of limited involvement to one of increasing engagement, the policy environment of NGOs and Civil society in general has also evolved gradually in Ghana.

The goal of the policy is for Government to engage Civil Society in the achievement of national priorities as provided in the GPRS I document. While the passage of this bill will enhance relations between Government and civil society in no uncertain terms, it will also mark a turnaround from a period of mixed feelings on the activities of the Civil Society sector to an era where the contributions and effectiveness of the strategies of NGOs and Civil Society in general can be measured without much difficulty.

### **NGO Strategy**

The concept strategy has historical links with military tactics and practical methods adopted to overcome opponents (Mitreanu, 2006). It also involves the use and close integration of economic, political, cultural, social, moral, spiritual, and psychological power to achieve a predetermined objective (Microsoft Corporation, 2005). The concept is used in relation to NGOs to consist of all activities integrated to form a package which when properly implemented would result in the achievement of the overall goal of the organization. It therefore involves the main steps and principles as well as all what the organization wants to do and how it would execute them in order to achieve its goal.

Some of the strategies that NGOs adopted towards poverty reduction included the provision of basic services, community empowerment, community participation and advocacy. In this regard, the strategies of NGOs would be measured through an evaluation of their projects to determine how they have helped to address the basic needs of communities, whether communities have been empowered and the extent of their participation in the planning process. The extent to which NGOs

are accountable to communities and their networks would also help to determine how they have organized themselves to overcome the task of reducing poverty.

### **Poverty**

Poverty is both a social and economic phenomenon that has been defined by various people depending on their background and orientation in life. Normally, those who define it with the purpose of formulating policies and devising strategies to deal with the situation happen to have no live experience. According to Rahnama (1996), phrases like “lack of” and “deficiency of” suggest some measure of poverty. However, poverty has been defined in terms of consumption and/ or income levels (White, 1998).

White et al (2001), maintain that even though material deprivation is at the core of poverty, it also includes deficient command over assets and access to key public services as well as vulnerability and insecurity which are worsened by an inability to prepare for disastrous situations.

A commonly used yardstick has been the number of people who live on two United States dollars in a day. The UNDP however observed that human poverty is much more than inadequate income or access to what is necessary for well-being. The concept also involves a denial of choices and opportunities that are basic to human development. It includes an inability to live a longer, healthier, fulfilling life; enjoying a quality standard of living with respect of others (UNDP, 1998).

Whatever the description given to poverty, the fact remains that it is relative and multi-dimensional (White et al, 2001; Republic of Ghana, 2003). It is dynamic and only those who experience it can best describe it (Kyei, 2002). In this regard, the perception of poverty among various stakeholders in the development process is very important since policy interventions formulated based on a myopic definition of poverty would not achieve the intended purposes. Thus, for the purpose of this study, the definition of poverty given by the UNDP is adopted since it provides a wider picture of the phenomenon practically.

### **Non-Governmental Organisations (NGOs)**

NGOs are an integral part of Civil Society. They embody voluntary, member-serving or public-serving activities. Institutions referred to as Not-for-Profit Organizations are synonymous to NGOs because the latter operate without any profit motive. If any profit is made at all, it is for the furtherance of their mission which may be charitable in nature.

Weaver, Rock and Kusterer (1997), observed that NGOs have been noted to be very active in those societies where interest groups lobby and mobilize inactive grassroots to participate in decision-making. Similarly, their capacity to influence policy at the local or national level depends on the collective behaviour of their membership. Their success at influencing policy positively enhances the functioning of democratic systems. This is because their activities help provide government with feedback.

In Ghana, many examples can be found of NGOs working in specified fields, such as Transparency International, Center for Democratic Development, ISODEC and Child Rights International that are working on corruption, governance, water privatization and child rights abuse respectively. Numerous other NGOS are directly involved in the provision of basic development services and the extent of their effectiveness is measured based on their ability to contribute significantly to positive change in the lives of the people.

### **Theoretical Underpinnings Of The Study**

The fact that the Civil Society sector and NGOs for that matter are diverse in nature in addition to the role expected of it in poverty reduction and development makes a review of related theories very important for the study.

## **Development**

Development theory has been metamorphosing throughout human history. Conceptually, the way development is perceived depends on one's own environment, which includes the type of ideological, social, economic and political orientation that one is accustomed to (Gustav, 2004). Thus, development has been perceived variously to mean growth in stages, modernization, distributive justice and the satisfaction of basic needs among others.

One school of thought prefers to regard development in terms of growth in a nation's per capita Gross Domestic Product (GDP). Another school of thought led by Dudley Seers considers development to have occurred when poverty, unemployment and inequality have all reduced from high levels and nothing is being done to affect this trend negatively.

Goulet (cited in Todaro 2000) argued that Development is a situation where society is humane such that sustenance (the meeting of the basic human needs including food, clothing, shelter and health), self-esteem (to be a person) and freedom from servitude (ability to choose) form the basis.

However, the World Bank (1991) indicated that the challenge that development poses includes the need to improve the quality of human life by enhancing income levels, ensuring better education, high standards of health and nutrition and reducing poverty to the barest minimum. It also includes the need for a cleaner environment, more equality of opportunity, greater individual freedom and a richer cultural life.

This indeed clearly demonstrates that Development, theoretically, is a multidimensional process whose objectives include, raising standards of living and increasing the range of choices available to humans. It also makes possible the availability of life-sustaining goods such as food, clothing and shelter and widening the scope of their distribution (Todaro, 2000).

## **Sustainability and Local Community Development**

Related to the development theory is the concept of sustainability of Local Community Development (LCD). Local Community Development is a process which involves organization, facilitation and action. It also allows people to create a community that they want to live in through a conscious process of self-determination. It is a framework in which the collective is more important than the sum of its parts (Wilkinson, 1991).

According to Maser (1997), LCD is a democratic process that works only when it is accessible and implemented by majority of the population. Local people are thus empowered by acting collectively through organizations to influence decisions, policies, programs and projects that affect them as a community. However, the theory of sustainable LCD states that local communities are influenced by the environment, just as the environment shapes the lives of the people in an attempt to meet their needs. It is only when there is harmony between the environment and the communities within it such that future generations are not denied resources to meet their own needs that there is said to be sustainable Local Community Development.

## **Local Community Development and Poverty Reduction**

This theory is relevant for NGO poverty reduction strategies because its adoption helps to determine the effectiveness of such strategies. This is because failure to target the root causes of poverty bearing in mind the regenerative capacity of available environmental resources would mean that the poverty reduction strategies have failed the sustainability test. When this happens, it would be needless to describe such NGO poverty reduction strategies as effective.

### **Sustainable Community Development and Ngo Effectiveness**

Alcantara, (1993), argued that sustainable development interventions have to meet seven steps. These include the need for interventions to be beneficiary driven and participatory in terms of empowerment. This means that projects should be initiated from below while interventions should make more resources available and build the capacity of the poor people to act for themselves. In addition to this, interventions should be based on problem identification as well as action oriented, using assessments and causal analysis. The analysis must also be scientific. The implementation process needs to progressively build on the status quo of the poor people. It is important that interventions are process oriented (iterative) while rooted in advocacy.

It should also be noted that another determinant of the effectiveness of NGO development strategies is the extent to which the poor are targeted. This is because if care is not taken, development projects would rather end up benefiting the people who are already better off instead of the poor.

Other theories that are of relevance to the analysis are the X and Y theories put forward by Douglas MacGregor (cited in Enrea et al, 1999). According to theory X, people are lazy, ignorant and unprepared to assume responsibility, hence they need to be directed, monitored and controlled. This theory favours a top down approach in which technocrats take major decisions regarding the development of the poor. Theory Y on the other hand indicates that people are capable and ready to work/participate if only they are motivated. Motivation in this regard can be in the form of provision of the right information, awareness creation, financial support and training in livelihood skills. Theory Y favours a bottom up or grassroots participation and is more relevant to NGOs in project/program planning, implementation and ownership by the grassroots. Even though theory Y is expensive to adopt in terms of time, money and other material resources, it leads to sustainability of projects while theory X tends to result in low ownership of projects by the grassroots.

### **Needs Theory and Ngo Effectiveness**

An application of Maslow's theory of hierarchy of needs is also vital in determining the effectiveness of NGO poverty reduction strategies. According to the theory, human needs are determining factors of human behavior. Thus, to Maslow, human needs include physiological needs which are biologically determined, safety needs which relate to freedom from bodily threat such as job security and training to acquire skills. Social needs include love, affection and a sense of belonging. Self-esteem needs however include desires of reputation, recognition and prestige. Self-actualization needs which are the highest in the hierarchy, relate to self-fulfillment and the desire to become all that one can become. Albanese et al, (1997) however categorized the human needs in a hierarchy of higher and lower level needs.

Needs of higher level are considered for satisfaction only when lower level needs such as physiological needs have been met.

The theory of hierarchy of needs highlights the complexity of human behaviour and hence the importance of needs assessment to ensure that interventions that are recommended would conform to the actual needs of the beneficiary communities. This ensures that priorities are not misplaced leading to wastage of scarce resources. It also helps to increase local community ownership of projects. Where the felt needs of beneficiaries are not identified before implementation of projects to address poverty issues, the expected outcome, which is a reduction in levels of poverty would never be realized.

### **Human Entitlement Sets and Poverty Reduction**

However, Amartya (1986) observed that poverty is the result of inadequacies in people's entitlement and endowment sets. This is because people's entitlement and endowment sets determine

the production and exchange capacity and the development situation at the household level. According to this theory, a person is regarded as poor if his/her entitlement set does not include a commodity bundle with enough food, clothing and shelter whilst his endowment set does not also contain enough of land, labour, health and power. Thus, any effective poverty reduction strategy should target the building of people's entitlement and endowment sets.

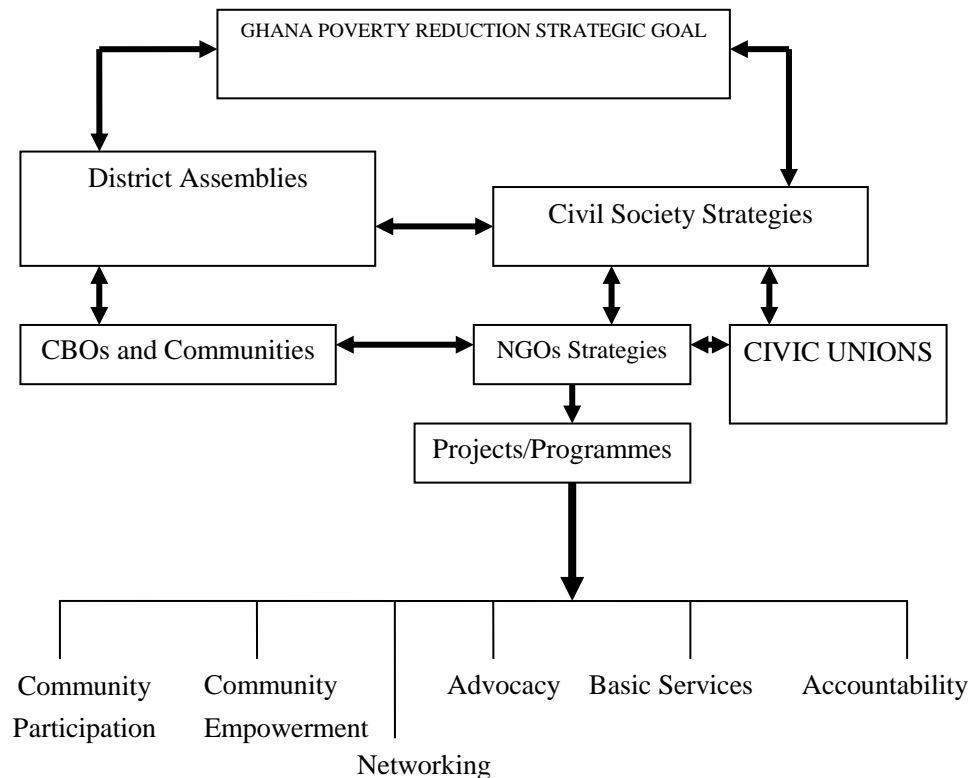
Even though the theory assumes undifferentiated household interests, this is normally not the case as both men and women in the household have different interests. Also, household poverty levels differ in terms of gender because endowment sets are not the same for men and women while the labour power of women in the household is not normally considered for their entitlement mapping.

It must be emphasized that all the theories discussed would facilitate the analysis and especially help to make an informed decision regarding the extent to which poverty reduction strategies of NGOs in the two districts are effective.

### **Framework for Analysis**

Analysis of the effectiveness of NGO strategies in reducing poverty in the two districts focused on the linkages between government and NGO institutions as well as civic unions with regard to Ghana's poverty reduction strategic goal of enhancing the living standards of the people. In this regard, variables such as community empowerment, participation and advocacy; the nature of NGO projects, accountability and networking also form part of the framework of my analysis (see figure 1).

Figure 1. Analytical Framework



## Findings

### Relationship of Communities with their District Assemblies in the Development Process

People are central of every development initiative. It is therefore necessary that efforts are made to include as many people in the District Development process as possible because they are the ultimate beneficiaries of whatever output that is generated.

### Relationship of Respondents to District Assembly in Development Decision-making

Effective community participation in development decision making at the district level is key to ensuring equitable distribution of resources. However, out of the 200 household respondents, only 15% indicated that their District Assemblies do not involve them in any way in taking development decisions while 74% were of the view that they have always been involved.

This implies that the decentralization process that has been introduced to bring governance closer to the grass roots is being accorded the necessary support by District Assemblies and communities. However, the fact still remains that more communities need to be involved in order to ensure that the intended benefits of decentralizing decision-making to the grass roots are shared by all. If this is not achieved, some of the communities would continue to rely on inappropriate information that would not enable them to make well informed decisions.

### Stakeholder Role in Funding of Development Projects

Collaboration among stakeholders regarding funding of development projects helps to generate synergy and ensure sustainability. It also promotes fair distribution of benefits. Household

respondents in Kasena-Nankana and Builsa Districts indicated that they and other development stakeholders including NGOs contribute more funds towards their development projects than the District Assemblies. Out of 200 respondents, 38% said the projects in their communities were funded through their own contributions and those of NGOs. However, as provided in figure 3.4, 33% of the respondents indicated that projects implemented in their communities were solely funded by their District Assemblies as compared to 29% of them who noted that funding was provided by all stakeholders.

This shows that when given the opportunity, communities are prepared to partner effectively with other stakeholders in funding projects that benefit them directly. In addition to this, having contributed their quota towards funding such projects; the communities would tend to demonstrate a sense of ownership. This is because of the realization that when the projects are allowed to go waste their contribution either in cash or kind would have been wasted.

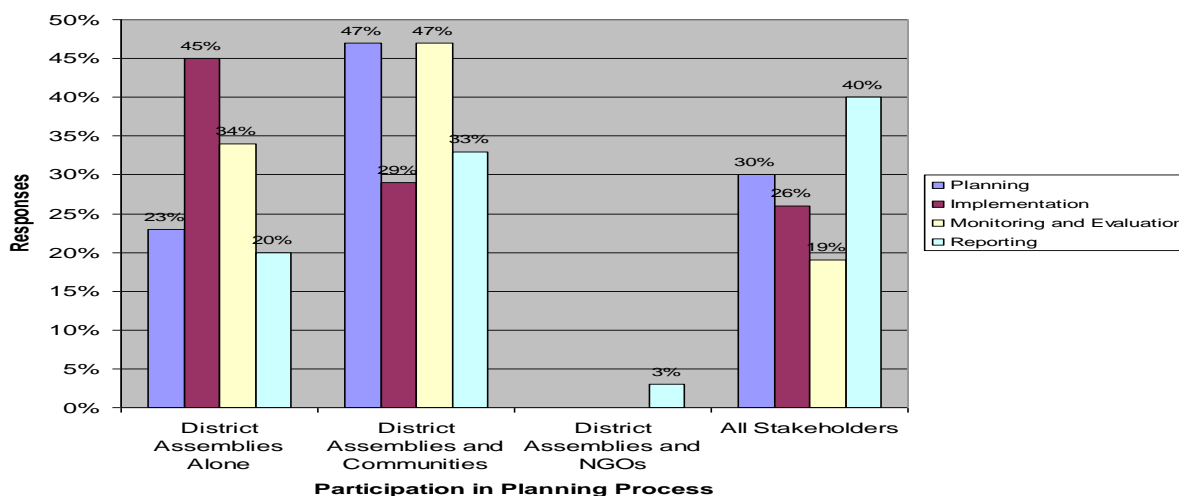
### Stakeholder Participation in District Development Process

The revelation regarding the keen desire of communities to participate in funding development projects initiated by them and other partners is further buttressed by their participation in the entire development process except in monitoring and evaluation where their participation was weak. For instance, it is clear from household responses represented in figure 3.5 that where ever District Assemblies planned directly with communities, their commitment to participate was always high as compared to when the Assemblies either planned alone or with all other stakeholders.

Participation was only 30% when other stakeholders are involved in planning because the views of communities are crowded out by other stakeholders who are outspoken and believed they are more knowledgeable. The implication of this is that adequate opportunities must be created by the District Assemblies and other stakeholders for communities to make constructive contributions in the planning process without fear of being considered ignorant.

It is also evident from the chart that direct collaboration of NGOs with District Assemblies alone is non-existent except in the area of reporting where a few NGOs submit reports about their activities in the districts to the Assemblies. This situation is not healthy and makes development co-ordination very difficult leading to duplication of interventions.

**Figure 3.1. Stakeholder Participation in the Development process of the Districts**



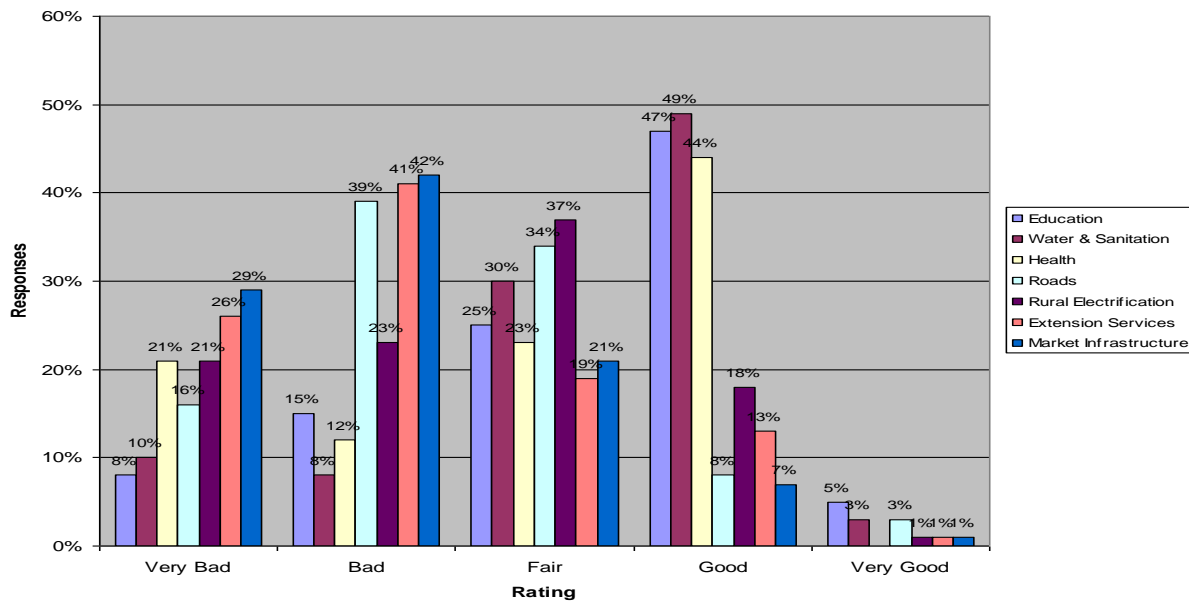
### Performance Rating of District Assemblies in the Execution of Development Projects

Respondents also indicated that the performance of their District Assemblies in terms of infrastructure provision and other support services in the education, health, and water and sanitation



sub-sectors has generally been good as compared to their performance in the roads, agriculture and commercial sub-sectors. These responses as shown in figure 3.6 were given in view of the fact that agriculture is the mainstay of the people, yet the Assemblies' role in developing this sector has been said to be half-hearted. For instance, the reality is that landholdings in the two districts are low but it is possible to increase output per unit area if farmers are given the right extension services to improve on soil quality and to reduce Post Harvest Losses. However, this is not being done and majority of the farmers had no alternative than to rely on their own traditional knowledge of farming. Unfortunately, this system of farming is not generating good results. Thus, the economic empowerment that communities desired has not been a reality.

**Figure 3.2 Performances Rating of District Assemblies**



### Community Empowerment

Community Empowerment as used here involves the capacity of communities to act on their free will to access appropriate information and to take the necessary steps aimed at ensuring that external agents working on projects in the respective communities are held accountable.

### Capacity of communities to access information on Development Projects

Without the right information, communities are constrained in seeking the best development for their areas. The District Assemblies are considered as the information nerve centres. Thus, communities' capacity to visit the District Assemblies and demand access to information regarding development projects is important in this regard. Out of the sampled respondents asked whether they were capable of getting access to specific project information, only 36% responded positively.

### Capacity of Communities to Hold External Agents Accountable

Accountability improves trust. However, where it is lacking, communities are expected to demand for it since their failure to do so normally leads to a situation where they lose the benefits they would have derived. In the case of the sampled respondents in the Kasena-Nankana and Builsa Districts, 200 household members who were asked what they would do when it is detected that external agents working on projects in their communities are corrupt, 5% of them said they have no power to act while 44% said they will report to the District Assemblies. Only 14% of them said they would insist that the right thing was done by the agents while 36% indicated their readiness to hold their community leaders accountable. The implication is that community members have inadequate

capacity to act on their own but would always have to rely on the District Assemblies to ensure accountability of external agents working in their communities. However, the staffs of the District Assemblies have noted that they have not been adequately equipped to be able to monitor the activities of NGOs. This therefore created a situation where NGOs operated as they deemed it fit.

### **Advocacy**

The study also revealed that of all the respondents interviewed, 27% noted that they ever attended an Assembly session. Since 73% of the respondents said they have never attended any District Assemblies' sessions or any People's Assembly session, it can be concluded that members of the communities are incapable of acting decisively on corruption. This is because people who attended those sessions considered them as windows of opportunities for the public to demand their rights directly from the District Assemblies and other external development agents. With regards to those who attended District Assembly meetings the following comments, experiences/lessons were expressed.

1. District Assemblies normally promise a lot but deliver very little development
2. There is a gap between what we actually need and what the Assemblies sometimes provide us
3. Community mobilization is very important if we are to succeed in developing our communities
4. There is an urgent need to step up food production
5. District Assemblies are not always on the ground because of inconsistencies in Chief Executives' report
6. People were brave enough to ask questions they would dare ask the Assembly people in their offices
7. The sharing of the District Assemblies Common Fund was explained
8. They were enlightened on the steps to be taken to get support from the Assembly for their communities
9. They learnt for the first time that it is everybody's duty to report corruption in the course of development projects' execution
10. It is sometimes better for us to get to the Assembly directly to seek for redress of issues than to rely on the Assembly member
11. The success or failure of the implementation of development projects also rests on the attitude of the community members
12. The meeting was used to explain Government policies
13. There is a strong need for more dams to be constructed

### **Views of Communities about Poverty**

The best people to describe poverty are those who experience it. In the case of the sampled respondents in the Kasena-Nankana and Builsa Districts, poverty lends itself to various descriptions and differs in terms of intensity depending on its causes. It relates to advancement in age, poor health and disability especially where there is no support from the extended family. According to the households, lack of access to land and farming inputs, low agricultural output and consequently one's inability to eat twice a day were indications of poverty. Other descriptions of poverty were people's inability to meet their food, shelter and medical needs, lack of access to land by widows,

joblessness, and lack of family support and the consumption of seed meant for the next cropping season. The rest were leaking mud huts, inadequate clothing, terminal sickness and a general sense of hopelessness in which death is considered a better option.

The communities indicated that the causes of their poverty were varied and required a four-prong attack if any impact was to be made. For instance, they cited bad weather, land fragmentation and bad personal traits such as laziness, drunkenness, womanizing and mismanagement of resources as the major causes of the incidence of poverty in the area. The detailed causes of poverty as enumerated by the respondents include widowhood, old age, ill-health, poor farm yields, high cost of farm inputs, land fragmentation and irregular rainfall as well as poor marketing systems. The rest are lack of alternative livelihoods, ignorance, laziness, drunkenness, womanizing and high cost of credit for investment.

### **Poverty Reduction**

In spite of various interventions by District Assemblies, NGOs and communities themselves, the sampled respondents provided indications that their poverty has not reduced remarkably. As presented in table 3.3, only 32% Of the sampled respondents said poverty has reduced. As many as 49% were of the opinion that their poverty had increased while 19% said there had been no change at all.

Those households that said poverty had actually increased happen to have monthly expenditure outlays of less than GH¢99 as indicated in table 3.4. They also spent more than 80% of their income mostly on food. They also indicated that the rest of their income was spent on clothing, shelter, medical care, purchase of textbooks and uniforms for their school children. The implication of this is that virtually nothing was always left for saving as a precaution against any eventuality. This trend also implies that the sampled respondents could not build on their capital stock in order to invest on income generating ventures leading to a vicious cycle of poverty.

### **NGO Effectiveness**

The major strategies and interventions adopted by NGOs in the two districts so as to reduce poverty were mostly long term investment projects including infrastructure provision such as the construction of hand dug wells and toilets, financial and logistics support to schools and school children, especially the girl child. Some of the strategies like limited supply of seed on credit, micro credit, donkey carts and agriculture technology transfer have immediate bearing on the economic activities of the people.

However, the respondents said these interventions were inadequate. For instance, they noted that most of them were compelled to consume the seed that was saved against the next cropping season in order to avert starvation. Their only hope was to benefit from the seed supplied by the Gia-Nabio Agro-forestry Development Organization but this was not possible because the Organization itself run out of stock. Beside this, majority of the farmers who benefited during the previous season could not pay back the principal plus the interest due to poor crop yields. They were therefore refused further supply of seed.

Another reason why the sampled respondents said the interventions of the NGOs were inadequate was related to the inability of the NGOs to introduce income generating activities as part of their interventions. This is because the respondents indicated that apart from the single cropping season which lasts for just five months, they are unemployed for the rest of the year and normally find it difficult making ends to meet. The respondents from Chiana, Katiu and Kayoro; most of whom were either harvesting wood to make charcoal for sale or hunting in the game reserves and were stopped from their trade vowed to start all over again because they felt they had not been provided alternatives by the NGOs.

The implication of this is that the gains that the NGOs made in conserving the bio-diversity would be seriously jeopardized when these people actually carry out their threats.

Apart from the above, the Hand Dug Wells that the NGOs constructed had not served respondents all year round because the wells normally dried up in March every year. This means that for up to three months the communities resorted to the use of contaminated water from ponds and streams. As a result, they contracted water borne diseases which further worsened their poverty situation.

In addition, the fact that these hand dug wells could not retain enough water for drinking meant that the opportunities for dry season gardening using the dugouts were very limited or non-existent.

Beside the inadequacy of the interventions of the NGOs cited, respondents also indicated that inappropriate targeting of the poor was one of the reasons why NGOs had not made significant impact on poverty reduction. The respondents indicated that some of members of their communities were poorer than them but the NGOs had not consciously identified such people among the poor to grant them first rate treatment. For instance, sampled respondents mentioned the terminally sick, the aged and widows as people who were very poor in the communities but because of their inability to attend meetings when staffs of the NGOs visited, their plight was mostly not considered during the introduction of poverty reduction interventions.

Effective collaboration between the District Assemblies and the NGOs was also considered a vital strategy for poverty reduction. This is because the District Assemblies had been granted the authority and responsibility to co-ordinate all development activities at the district level. As a result, whatever interventions that NGOs make were expected to complement development efforts of Government. However, the fact that sampled respondents mentioned instances where they reported faulty execution of some NGO projects to the District Assemblies only to be told that they were not aware of such NGO projects provided an indication that collaboration had been low. This implies that co-ordination of development programmes of the two stakeholders had not been effective.

In addition to the ineffective collaboration, another reason cited by respondents for the insignificant impact of NGOs on reducing poverty was that of poor accountability. NGOs were able to raise funds and other resources from donors because of the general perception that their guiding principle was service to humanity. They had also demonstrated to their donors who were mostly from the advanced countries that they could be trusted to deliver services and other support that was required to get the poor out of their predicament better than Government. However, as many as 84% of the respondents said that NGOs were not accountable to communities. This was because the NGOs hardly discussed the quantum of resources that they raised to invest in poverty reduction ventures and what was actually invested in the communities.

The District Assemblies agreed with the views of the respondents that the NGOs were, indeed, accountable but their accountability was to their donors. However, the NGOs themselves believed that they were accountable to District Assemblies, communities and their donors. The implication of this is that so long as communities and District Assemblies continued to hold suspicious opinions about the activities of NGOs, collaboration between them to reduce poverty cannot create a synergic effect in the development situation of the two districts. It was therefore against these reasons that 48% of the respondents were of the opinion that the strategies of NGOs had significantly reduced their poverty levels. Conversely, 38% of the respondents indicated that the strategies had no impact while 14% stated that they had actually ineffectively reduced poverty.

Two main reasons were given for the effectiveness of the strategies of the NGOs. The first reason was about their support in providing infrastructure such as water, places of convenience, community clinics and nutrition centres. In addition, the NGOs had also succeeded in rekindling the

communal spirit of communities in the execution of infrastructure projects in addition to the significant support given to educational institutions in the two districts especially the Girl-child Education Programme and the Quality Improvement Programme in Schools (QUIPS) as well as the School Health Programme (SHEP). These had been complemented by the Government's Capitation Programme to increase school attendance and retention in the area.

Half of the NGOs operating in the two Districts that had been reporting their activities to the District Assemblies for co-ordination purposes brought tremendous help to the districts' development process. This had been because instances where limited District Assembly resources had been spread thinly among all the communities due to lack of information about the existence of specific NGO interventions in some of the communities had been averted. As a result instances of duplication of efforts concerning NGOs that reported regularly to the District Assemblies had been non-existent.

However, the reasons that the respondents gave for the lack of effect on poverty reduction regarding NGO strategies related to respondents perception that whatever interventions NGOs brought to their communities must necessarily be tailored to meet their immediate felt needs. This assertion by the respondents is partially tenable because they must survive first before they think of the future generations. The part that they got wrong relates to the fact that without the basic infrastructure such as schools, places of convenience and clinics the phenomenon of poverty would continue to revolve round the communities.

Another reason the respondents gave for lack of effect of NGO strategies in poverty reduction was about the number of people who benefited from the interventions of NGOs. According to them, the resources invested in the communities were inadequate as compared to the population of the area. Beside this, they lamented that the poverty reduction programmes of NGOs had not been pro-poor since they had not consciously identified the poorest of the poor. For instance, the respondents noted that disaster relief items brought to the communities were rather given to people who were not considered as the poorest.

With regards to respondents who felt the strategies of NGOs were ineffective, poor co-ordination, corruption on the part of some local NGO officials and lack of income generation activities in NGO poverty reduction programmes were cited as the major reasons why their poverty situation was still serious.

The implication of this is that respondents' expectations from NGOs to support them to reduce their poverty were higher than what has been delivered. However, some progress had been made because when the respondents were given the opportunity to give a general evaluation of the performance of the NGOs, none of them said they preferred to be without the support that the NGOs had given.

Notwithstanding this general evaluation, respondents were emphatic that the NGOs could have performed better. As they had indicated, the major causes of their poverty situation were varied and required equally varied interventions simultaneously in order to achieve the significant level of poverty reduction that had been expected. This means that the NGOs were expected to have adjusted their strategies to address all the inadequacies and to have strengthened further their strong points.

### **Views of community groups**

Focus Group Discussions were held with five different groups made of the Abambazanga Women Group who operate a poultry farm, Irrigation Farmers Group, Association of Tradesmen and Women (MOCAS), Assembly Members Group and a Group of former hunters from Kayoro all in the Kasena-Nankana District. With regards to the Builsa District, three Focus Group Discussions were held. The Discussion with irrigation farmers of the Siyagsa/Badomsa community at Wiaga was divided into male and female groups. This was done because from experience, any time men and

women were brought together in the area for a meeting, the former tended to dominate the discussions, hence the adoption of this technique to avoid such male dominance. The third group was made up of eight Assembly members of the District.

The Focus Group Discussions revealed that the participants were in agreement with the descriptions given by sampled household respondents but differ slightly from the way Assemblies perceived poverty. Participants of the Focus groups gave various descriptions of poverty.

The group of former hunters indicated that poverty includes among others the inability to eat twice a day and lack of family support. The Association of Tradesmen and Women, the Abambazanga Women Group and the Group made up of Assembly members described poverty as an inability to pay one's medical bills and also meet his/her other basic needs including food, clothing and shelter as well as physical disability. The three Irrigation farmers Groups concluded on two different notes. The Female Irrigation Farmers Group indicated that poverty was a situation of hopelessness while the Male Farmers Group emphasized the preference for death over living.

With regard to the causes of poverty, the Former Hunters Group cited soil infertility and the breakdown of the extended family system as the causes of poverty. The Association of Tradesmen and Women, the Abambazanga Women Group and the Groups of Assembly members mentioned ill-health, unemployment and laziness as the causes of poverty while the Irrigation Farmers Groups indicated low crop yields and poor marketing systems as the causes of their poverty. In terms of their coping strategies, the Former Hunters noted that since they had been stopped from hunting, the only other means of surviving the long lean season had been gathering of fuel wood and charcoal burning. This implies that the very game that the NGOs tried to protect by stopping the hunters was still being threatened by logging for the purpose of making charcoal and unless a lasting solution could be found, the previous successes achieved would have been negated.

The Association of Tradesmen and Women on the other hand were of the view that the formation of their association was a means of coping with the poverty situation since through it they were recognized by the District Assemblies and a few other NGOs who supported them occasionally with micro credit and training. The Abambazanga Women Poultry Farmers Group however indicated that their farm had been a very reliable coping strategy even though there were times when they lost a good number of their pigs as a result of disease outbreaks. In the case of the Assembly members, there was no coping strategy better than the creation of employment by Government to reduce the increased out migration of the youth to southern Ghana. The irrigation farmers also said their farming activities and fishing were their only coping strategies.

The discussants also noted that the support of the District Assemblies has been limited to infrastructure development and provision of loans to selected persons. Assembly members and Former Hunters of Kayoro argued that the District Assemblies had not performed creditably whereas the other groups thought the Assemblies had done well. The groups were however of the view that interventions of the NGOs were inadequate to reduce poverty significantly. With Regard to the relationship between Focus Group Discussants and District Assemblies in the development planning process, all the focus groups except the Irrigation Farmers were in a consensus that the District Assemblies always consulted them.

The relationship between the District Assemblies and Irrigation farmers Group was poor with respect to consultations during planning exercises. Members of this group intimated that they had not always been consulted in the planning process even though it is a fact that their contribution to food security in the area had been remarkable. They indicated that the District Assemblies had not worked hard enough to increase the number of dams and dugouts constructed to support irrigation farming and protect them from market queens from Accra who bought their tomatoes at 'give away prices'.

There was also a consensus among the groups that their relationship with the District Assemblies regarding the funding of education, water and sanitation, health and agriculture extension services was fair. They added that their relationship with the District Assemblies concerning funding of rural electrification projects was good while that of market infrastructure and creation of access to farming inputs was bad. According to them, traders always sat in the scorching sun to conduct their businesses while the District Assemblies look unconcerned and at the end of the day collected market tolls.

In the case of access to farming inputs, the groups were emphatic that the tractors procured by the District Assemblies to help interested farmers to plough their lands were not providing the intended benefits because of mismanagement.

The five focus groups rated the general performance of the District Assemblies in delivering educational and health projects as well as information sharing as good. They rated water, extension services and micro credit fair because of inadequacies in project delivery. Road construction, market infrastructure and rural electrification projects were rated bad because most communities have either not had access to such services or project execution had been delayed. The groups indicated that they had always been on the look out for lapses so that they could report to the District Assemblies to ensure that the right thing was done. They however expressed worry about the bureaucratic tendencies of District Assemblies and a high tendency of not getting good results from reported lapses since they believe the contractors and staff of the Assemblies connived to cheat communities.

Assembly members indicated that they had always consulted the District Chief Executive directly whenever contractors working on projects in their communities misconducted themselves. They cited instances where projects for their communities were awarded without their prior notice.

The Hunters Group, however, indicated the importance of their chiefs in issues of this nature.

Apart from the Association of Tradesmen and Women Group and the Abambazanga Women group whose opinion was that poverty had fairly reduced, the other three groups including the Former Hunters, Irrigation Farmers and the Assembly members said the poverty situation in the two districts was serious.

Among the five Focus Groups, only the Poultry Farmers Group indicated that the interventions of NGOs had been fairly effective at reducing poverty levels in their district. Three other groups including the Former Hunters, Irrigation Farmers and the Tradesmen and Women Groups noted that the interventions of NGOs were too meager to have made any meaningful impact on the poverty situation of the two Districts. However, the Assembly members argued that such interventions had been less effective.

All the Focus groups except the Former Hunters Group indicated that NGOs were accountable to only their donors. The Former Hunters Group was of the view that it was only the NGO operatives who held the truth about what they had done with the funds they raised with the aim of supporting needy communities.

With respect to the overall performance of the NGOs, the focus group discussions revealed that the overall performance of NGOs in reducing poverty in the two districts had been fair given their low investment in income generation activities as compared to infrastructure provision.

### **Views of Non-Governmental Organisations**

Questionnaires were administered to ten NGOs to determine how effectively their strategies were contributing to poverty reduction in the Kasena-Nankana and Builsa Districts. Apart from the Rural Women Association (RUWA), none of the NGOs gave indications that they had targeted the poorest of the poor. UNICEF and New Horizon were the only NGOs that focused specifically on the

development of children. None of the NGOs worked specifically in support of the youth and the aged.

### **Description of Poverty by NGOs**

NGOs also described poverty in various terms including inability to satisfy life-sustaining needs, deprivation of every sort, inability to live decent lives and lack of opportunities to make life worth living (see table 3.3).

### **The Effectiveness of the Strategies of NGOs**

Three of the NGOs including the two international NGOs indicated that their strategies were very effective in reducing poverty while the other seven NGOs stated that their strategies were fairly effective.

The NGOs however gave various reasons why they stated that they had been effective at reducing poverty. Rural Aid for instance indicated that its partnership with the Kasena-Nankana District Assembly and the communities had contributed in increasing water coverage from 56% to 67%. Other NGOs cited increasing demand by communities for their support, increasing donor support and reduction in the cost of fertilizing farms as some of their achievements. The two international NGOs cited increased school attendance of girls as one of their achievements.

### **Relationship between NGOs and District Assemblies**

Apart from RUWA, which stated that as a result of the role it played in identifying lapses in the utilization of HIPC resources; senior officials of the Kasena-Nankana District Assembly had consistently sidelined it in very important programmes, the rest of the NGOs said they maintained good relations with the District Assemblies in the areas of planning, reporting, attendance of meetings and capacity building.

In the case of meetings, such as People's Assembly Sessions, only UNICEF and GAIT noted that they had the opportunity to address the people. The rest of the eight NGOs had merely observed proceedings. They however said such meetings enabled people to express their worries regarding activities of external agents in their communities.

### **Roles Played by Communities in Project Initiation, Planning and Implementation Process**

The NGOs mentioned that communities had been active in identifying their needs and mobilizing their members to provide communal labour. For example, much emphasis were placed on the leadership role that target communities assumed during the identification of needs and contributions in kind such as construction materials like sand and stones that are readily available in the localities.

### **NGOs Networking**

Each of the NGOs mentioned the existence of other NGOs in the communities where they operated but apart from the coalition of NGOs providing water and sanitation infrastructure, the rest of them have not had any formal relations. The implication of this is that a fertile ground had been created for duplication of efforts. RUWA for instance indicated an instance where another NGO receiving support from the same donor reported on projects that it did not execute.

### **Discussion of Projects with District Assemblies in the presence of Communities**

Only four out of the ten NGOs reported that they had been discussing issues regarding their projects at meetings where the communities were also present to contribute. This provided an indication that linkages between NGOs, District Assemblies and communities, were not the best.



The NGOs however expected that the District Assemblies would withdraw the 5% cash contribution that communities were expected to make as counterpart funding for the provision of water and sanitation infrastructure. According to them, this practice deterred many communities who genuinely need such services from accessing them. They also expected that District Assemblies would be more open and eschew bureaucracy while embracing whatever little support that NGOs provided. The NGOs, however, expected that communities would lobby their District Assemblies and be more assertive on their rights and report corruption promptly. They were also expecting communities to work hard to reduce their dependence on external support.

### **NGO Rating of Relations with District Assemblies**

Out of all the NGOs that responded, 60% of them rated their relations with District Assemblies as effective. However, 30% of the NGOs stated that relations with the Assemblies are just effective while 10% indicated that such relationship was less effective. This rather high level of effectiveness presented by the NGOs had been refuted by the District Assemblies and sampled household respondents.

### **Rating of Relations with Communities**

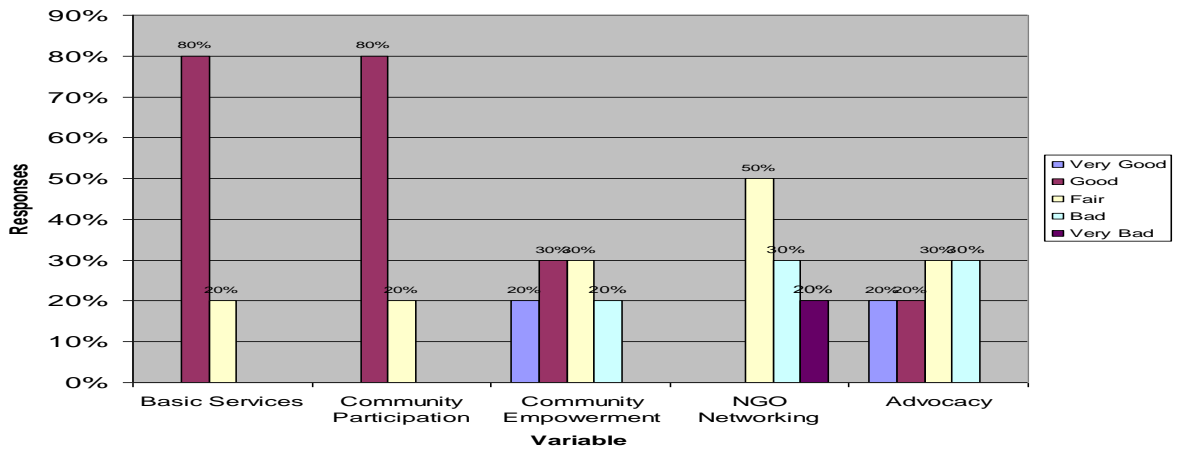
Out of all the NGOs surveyed, 70% of them stated that they enjoyed their relations with the target communities and rated their relations with them as effective while 30% of the NGOs said relations with the communities had been just effective. With regards to their accountability records, all the NGOs surveyed were emphatic that they had been accountable. However, 50% of them indicated that they were accountable to their target communities and donors while the other 50% of them said they were accountable to their donors, Board of Directors, Government and their donors other than communities.

The NGOs gave various reasons why they had always strived to be accountable. These included the need to gain the trust and support of people who were considered strategic to the continuous survival of their organizations. They added that without rendering account of their activities it was not possible for them to meet their goals. Beside this, they indicated that they owed allegiance to communities on whose behalf funds were raised for investment in poverty reduction projects. GAIT for instance noted that the communities had a right to demand for NGO accountability. Above all, the NGOs concluded that their donors were their live wire without whom there would be no funds to operate while their Board of Directors had the responsibility to control the running of the organizations. The implication is that accountability of NGOs to their target communities remained an issue that must be addressed properly before people will repose all their trust on them.

### **Overall Performance Rating of the NGOs**

The rating done by the NGOs indicated that their strongest area was the provision of basic services and enlisting of community participation. They were weak in community empowerment, networking and advocacy. For instance, 70% of the NGOs rated their own performance in the provision of basic services as good. In the case of community participation, 80% of the NGOs rated their performance as good. This compared dismally with the other areas where not more than 40% of the NGOs rated themselves as either good or very good. Instead, they rated their performances as either fair or bad. This trend is depicted in figure 3.3.

**Figure 3.3 Overall Performance of NGOs in Kasena-Nankana and Builsa Districts**



Having run correlations between responses on the level of poverty reduction and household weekly expenditure levels, the result was a correlation coefficient of 0.9 and a coefficient of determination of 0.81. This means that 81% of the variation of household expenditure can be explained by the poverty situation in the two districts. This means 19% of the variation in household expenditure is explained by other factors.

In a similar vein, when responses on the level of poverty reduction was correlated with responses on the effectiveness of the relationship between District Assemblies, communities and NGOs, a correlation coefficient of 0.94 was the result. This gave a coefficient of determination of 0.88 meaning that 88% of the variations in the responses on poverty reduction were explained by that on the relationship between the three major stakeholders in the development process in Builsa and Kasena-Nankana Districts.

The last correlation was done between the effectiveness of the strategies of NGOs and responses on the level of Poverty Reduction. Here, a correlation coefficient of 0.87 was the result while the coefficient of determination was 0.76. This also gave an indication that 76% of the variation in the responses relating to the level of poverty reduction could be explained by the effectiveness of the interventions of NGOs in reducing poverty in the study area. Only 24% of that variation was explained by other factors.

Consequently, given the high correlation coefficients realized, it was clear that extraneous factors had very little influence on the results and that they were a reflection of the situation in the two districts, which was that the poverty situation of the people had barely reduced in spite of the strategies adopted by NGOs to fight it.

### Conclusion

In the face of increasing global social and economic challenges, Governments in Africa and Ghana in particular could no longer adequately cater for the needs of the people and NGOs have stepped in to plug the gaps by contributing to poverty reduction. This task has, however, been a daunting one since the effectiveness of the strategies of NGOs dictates whether or not they would succeed in reducing poverty.

The Upper East Region has been one of the four spots in Ghana where poverty is defying interventions so far. The fundamental question that required an answer has been why this trend of affairs? Could it possibly be that the collaboration between stakeholders was not effective or the strategies of the NGOs have not been effective?

A desk study and a field survey of NGOs and communities, interviews with staff of the Kasena-Nankana and Builsa District Assemblies as well as discussions with groups of people who formed part of civil society in the area provided answers to the questions.

The literature showed that there has not been any remarkable reduction in poverty in the two districts even though NGO numbers have increased dramatically. This has been attributed to ineffective targeting of the poor, poor accountability on the part of NGOs and weak collaboration between NGOs and local government authorities.

The literature however pointed the fact that local people can be self-reliant if they are given the right motivation and facilitation and empowered through the building of social capital.

Results of the field survey, however, indicated that collaboration between NGOs and District Assemblies is low and that the latter need to improve their strategies and increase their investments in the districts in order to make a significant impact on poverty reduction.

## References

- Adu, Kofi (2005), *Enhancing Civil Society Participation in Government Decision-making*. Ghana Association of Private Voluntary Organizations in Development (GAPVOD) Paper presented at the Global Forum on Civil Society Law, Istanbul, Turkey.
- Albanese, R., McClure, G.F., and Wright, P., (1997), *Management*. Houston, Dame Publications.
- Alcantara, (1993), *Real Markets, Social and Political Issues of Food Policy Reform*. London, Frank Cass
- Amartya, S., (1986), "Food Economics and Entitlement" in *Lloyds Bank Review*. London, Oxford University Press.
- Clark, J., (1991), *Democratising Development: The Role of Voluntary Organisations*. West Hartford, CT: Kumarian Press.
- Cotter, Jim (1988), *USAID-Financed PVO Co-financing Project in the Philippines and Indonesia: Reshaping the Terms of PVO Collaboration*. The American University Press, Washington DC.
- Enrea, F.C., Putieger, R. (1999), *Mastering Basic Management* (third edition). New York, Macmillan Press Ltd.
- Fisher, Julie, (1993), *The Road from Rio: Sustainable Development and the Non-governmental Movement in the Third World*. CT: Praeger Publishers.
- Ghana Republic of, (2002), *2000 Population and Housing Census Report*. Ghana Statistical Service Department, Accra.
- Ghana Statistical Service, (2007). *Ghana Living Standard Survey. Report of the Fifth Round (GLSS 5)*, Ghana Statistical Service, Accra.
- Ghana, Republic of (1999), *Ghana Living Standards Survey Report*. Ghana Publishing Corporation, Accra.
- Ghana, Republic of, (1992), *4<sup>th</sup> Republican Constitution (Act 35 and 240)*. Ghana Publishing Corporation, Accra.
- Ghana, Republic of, (1994), *National Development Planning Systems Act, 1994, (Act 480) Volume 1, Analysis and Policy Statement*, National Development Planning Commission
- Ghana, Republic of, (2003), *Ghana Poverty Reduction Strategy, (2003-2005)*. Ghana Publishing Corporation, Assembly Press / National Development Planning Commission, Accra.
- Ghana, Republic of, (2003), *Ghana Poverty Reduction Strategy: Analysis and Policy Statement. Vol.1*. Ghana Publishing Corporation, Assembly Press / National Development Planning Commission, Accra.
- Ghana, Republic of, (2010), *The Coordinated Programme Of Economic and Social Development Policies, 2010 – 2016: An Agenda for Shared Growth and Accelerated Development for a Better Ghana*. Ghana National Development Planning Commission, Accra.
- Goodin, R.E., (2004), *Democratic Responsibility: The Third Sector and All*. Research School of Sciences, Australia National University, Canberra, Australia
- Gustav, R., (2004), *The Evolution of Development Thinking: Theory and Policy*. Yale University Economic Growth Centre. Discussion paper No. 886.

- Gyimah-Boadi, E., (2003), *Towards an Enhanced Role of Civil Society in the Fight Against Corruption*. CDO, Accra, University of Ghana, Legon.
- Kokor, J.Y., (2001), *Local Governance of Development in Ghana*. Spring Research Series No. 30. SPRING Centre, University of Dortmund, Germany.
- Kyei, P.O., (2002), *Decentralisation and Poverty Alleviation in Rural Ghana*.  
<http://unpan1.un.org/intradoc/images/docgifs/IDEP.GIF>
- Lukkarinen, M., (2006), *Community development, Local Economic Development and the Social Economy*. Community Development Journal, Vol. 40, No. 4, Oxford University Press, London.
- Mackie, J., (2000), *NGOs and their role in promoting Civil Society*. The Courier, Number 181, June-July 2000
- Maser, C., (1997), *Sustainable Community Development: Principles and Concepts*. Florida, St. Lucie Press.
- Microsoft Corporation (2005), *Encarta Encyclopedia*. Microsoft Corporation, United Kingdom.  
<http://www.microsoft.com/uk>
- Mitreanu, C., (2006), *Corporate Strategy*. Vol. 47, No. 2. <http://www.redefiningstrategy.com>
- National Consultative Group, (2002), *Draft National Policy for Strategic Partnership with NGOs*.
- Safo, Amos, (2003), *The Changing Culture of NGOs in West Africa*.
- South African Institute of International Affairs, (2004), *Ghana and Civil Society Clash over Allegations of Corruption*. Volume 2, April, 2004
- Todaro, M.P., (2000), *Economic Development*. Addison Wesley Longman, Inc. New York
- UNDP (1998), *Human Development Report*. Oxford and New York, Oxford University Press
- Weaver, J., Rock, M.; and Kusterer, K. (1997), *Achieving Broad-based Sustainable Development: Governance environment and Economic Growth with Equity*. West Hartford, CT: Kumarian Press
- White, H. (1998), *Qualitative and Quantitative Approaches to Poverty Analysis: Conflict, Complementary or Synergy?* A paper presented at DSA Conference University of Bradford.
- White, H., Killick, T., Steve, K.M. and Savane, M.A. (2001), *African Poverty at the Millennium: Causes, Complexities and Challenges*. International Bank for Reconstruction, Washington DC. USA
- Wilkinson, K., (1991), *The Community in Rural America*. Greenwood Press, New York, NY.
- World Bank, World Development Report, (1991), *The Challenge of Development*., New York, World Bank.

# The Impact of Mergers and Acquisitions on Shareholders' Wealth: Evidence from Nigeria

---

**Abeleje Kayode Richard,**

*Dept. of Accountancy,*

*The Federal Polytechnic, Nasarawa Nigeria*

**Liafisu Sina Yekini**

*Sheffield Hallam business school, Sheffield*

*S1 1WB*

## **Abstract**

This research paper seeks to validate the controversial post-merger synergy in Nigerian context. According to theory, mergers and acquisition should enhance synergistic effect to the advantage of the shareholders. This paper evaluates whether post-acquisition value attributable to shareholders of Nigerian banks surpasses that of the pre-acquisition period. The paper uses a fifteen year secondary data of five judgementally selected banks to analyse and compare pre-acquisition and post-acquisition shareholders' value in a balanced manner. The measurement index of shareholders' wealth is a modified version of the ROE (Return on Equity). SPSS version 20 and Excel spread sheet was also used to get the R, R<sup>2</sup>, T-test and F-test. It was discovered that shareholders' fund strongly influenced the profitability of the Nigerian banks but value to shareholders in the post-acquisition period is lower compared to the pre-acquisition period. Managers of Nigerian banks should not rest on the oars of government initiatives. They should be proactive in their operation as far as profitability is concerned. This research is the first of its kind to make a balanced and up to date comparison of pre-and post M&A period (ie 7yrs pre-merger & 7yrs post-merger). The index of measurement is modified ROE that incorporates only what relate directly to shareholders alone.

**Keywords :** Basel II, Consolidation, pre-consolidation, post-consolidation, profitability, value-to shareholders, banking sector.

## Introduction

One of the initiatives in checking the tide in global banking system after the economic meltdown is the Basel II as recommended by Basel Committee on Banking Supervision in 2004. The guideline emphasized capital adequacy as the bailout against operational and financial risks faced by banks. In addition to this, economic vitality and stability of every nation is a function of the soundness of its financial system. This triggers the consolidation exercise scheme devised by the CBN governor, Prof. Soludo to sanitise the Nigerian banking system. This is a bold step in right direction but the question remains: are the banks prepared enough at the time of consolidation to the benefit of their owners? The purpose of this study is therefore to examine the post-acquisition period and the pre-acquisition period to see the period at which the value to shareholders is maximized.

Merger and acquisition is a popular and global phenomenon especially in this era of globalisation. The strength of every economy is determined by the soundness of its financial system. In order to restore public confidence and sanitise the Nigerian banking system, the former governor of the Central Bank of Nigeria, Prof. Chukwuma Soludo made the announcement on July 6, 2004. The reform process started with recapitalisation and consolidation policy. Merger and acquisitions as business strategy is usually initiated by the management with the consent of their shareholders. However, the case in Nigeria is different as consolidation exercise was imposed by the Central Bank Governor in order to prevent the banking system from decaying. This research therefore intends to study the effect of the policy on shareholders. This is done by assessing the pre-consolidation era and the post consolidation era in order to discern if merger and acquisition has in any way increased the wealth/ values of shareholders of Nigerian bank.

Basic finance theories argue/suggest/postulate that value is created (synergy) when two or more firms merge. However empirical evidences on this have been controversial and differ as countries differ. In UK for instance, merger is found to have induced significant benefits in productivity (Huizinga, Nelissen, & Vander, 2001) while it was found that little improvement in cost efficiency is observed in the USA (Esho, 2001; Sathye, 2001). In Europe, there are mixed conclusions on the benefits of consolidation (Esho 2001; Sathye 2001; Di'az, Garcia and Sanfilippo, 2004;). Evidence from Asian countries such as Japan is also mixed and vary with the period analysed. (Drake & Hall, 2003). Some authors discovered that shareholders' value increases on post-merger and acquisition while some found that it diminishes (see Cavallo & Rossi, 2001; Carbo & Humphrey, 2004). The research question therefore seeks to clarify the controversial issue and strive to know what the answer will be in relation to Nigeria.

Merger and Acquisition is an unpopular phenomenon in Nigeria banking system compared to developed countries like UK and America. It came as an order from the CBN to be complied with against their readiness. As banking system is vital in every economy and for its growth, shareholders will be happy to see their investment thriving and secured in a growing economy. In addition to this, the only sector that witnessed massive M&A in Nigeria is the banking sector. This paper therefore, intends to see if the government initiative to sanitize the banking system through consolidation has in anyway impacted shareholders' wealth.

The state of the Nigerian banking system before consolidation is also a motivation for this research. The number of banks pre-consolidation was on constant increase as it is to the number of failures. Some of the identified problems include personalised ownership structure, poor liquidity, poor customer satisfaction and unethical banking practices (Mohammed, 2005; Okpanachi, 2011). Furthermore, import financing was favoured than encouragement of domestic growth. These account for the financial inefficiency and shareholders could not get stable and high dividends. This study seeks to answer the question: 'does post-consolidation era enhance shareholders' wealth than the pre-consolidation era? The research question is further divided into the following hypotheses:

### **Hypotheses formulated**

- i. H1: There is significant relationship between shareholders' fund and profits due to shareholders of Nigerian banks.
- ii. H2: Significant difference exists between average VTS pre-acquisition and average VTS post-acquisition

The remainder of the paper is organised as follows. The next section discusses relevant theories around M & A and empirical results in M & A studies. The following sections explain the methodology, and present the empirical analyses, with the concluding remarks containing a summary, limitation of the study and directions for future research.

### **Literature Review**

#### **Neoclassical theory and M & A**

Creation of wealth for shareholders is at the centre of investment and financial decision made by managers in line with modern finance theories (Watson & Head, 2013). They posit that an investment is said to be worthwhile if the sum of the present values of its future cash flows exceed the initial outlay of the project. The resulting difference is tagged net present value or net benefit of such project. The shortcoming of this proposition is that how realistic is the future estimations of cash flow made even where inflation factor is considered? Another issue against this is the estimation of cost of capital with which the cashflows can be discounted. However, M&A is said to maximize value if value added by the acquired company exceeds the cost of its acquisition.

Managers of the target and acquiring firms will tend to be willing to go into M&A provided value to shareholders would likely to be maximized. This means that both firms expect positive gains (synergy) from the deal (Berkovitch & Narayanan, 1993; Bruner, 2004). In the words of Bruner (2004) "true synergies create value for shareholders by harvesting benefits from mergers that they would be unable to gain on their own". Hence, managers need to be strategic in making a thorough analysis of the economic and operational activities of firms under consideration for merger in order to identify possible areas of synergy from which value can be created to maximize shareholders' wealth.

Contrary to the argument of Miller and Modigliani (1958) that the market value of a company does not depend on its capital structure therefore resulting into no financial synergy, financial synergies has been established to exist in M&As of firms. The assumptions such as existence of efficient market, no transaction costs, zero tax, information asymmetry among others, on which Miller and Modigliani based their theory, makes it unrealistic in application to M&As (Flugt, 2009).

In addition to this, the resulting effect of leveraging M & A activities with individual activities is financial synergy. This strongly opposed the opinion of Miller and Modigliani (1958), who in their view posited that no financial synergy can be found where market is found to be efficient; characterised with informational asymmetries and absence of taxes and default cost. They emphasized that the value of a company is not determined by its capital structure. Hence, when the scope of a firm changes due to M&A, an optimal capital structure is often achieved and financial synergy is likely to be created.

Lewellen (1971) suggested, by using portfolio distribution theory that there is tendency that the joint probability of financial distress will reduce and borrowing capacity of the emerging firm will increase. The conclusion was made from the observation of the cashflows of two or more firms which are less than perfectly correlated. Increased debt capacity of the combined firm will result in higher optimal leverage and tax saving which will ultimately result into value creation for shareholders.



Likewise, Seth (1990) opined that target and bidder firm of the same market and demand will likely have a lower synergy gains from coinsurance especially if their earning streams are highly correlated. Further empirical evidence of the coinsurance hypothesis that support this are: Kim & McConnell (1976) for conglomerate mergers; Higgins & Schall (1975) who suggested lower risk may increase the value of the merged firms. Diversification is also another widely cited motive for M&A. However, if the argument of Bruner (2004) above is factual, then it is unlikely that diversification qualify as a pure financial synergy because investors can combine a personal portfolio with the similar risk characteristics where capital market is perfect.

Lang & Stulz (1994) and Berger & Ofek (1995) in their empirical studies observed using Tobin's  $q$  that diversified firms have lower values than a portfolio of specialized firms in an imperfect market. Therefore, from financial perspective, shareholders may not benefit fully from the diversification. Based on the propositions above, operating and economic synergies outweigh financial synergies in value maximisation despite its tendency of shifting the optimal point of cost of capital. It is therefore "the most dominant value-maximization motives for firms engaged in M&A activity" (Flugt, 2009).

## **2.2 Behavioural theories and M&A**

Roll (1986) in his hubris hypothesis suggests that managers in their evaluation of M&A bid tend to be too optimistic and often approach it with over-confidence. No rational bidder will be interested in the bid where bidders' valuation is greater than the true value of the target. Worthy of consideration in this school of thought is the managerial motive as a vital factor in determining the outcome of M&A. Managers have been observed to be protecting their own interest, (Flugt, 2009) called it 'empire building' instead of maximizing value for the benefit of shareholders which is the central objective of classical finance theory as mentioned above (Zalewski, 2001; Trautwein, 1990).

In the opinion of Jensen (1986, 1988) managers will not mind investing their free cashflow in negative NPV projects such as acquisitions provided their personal utility can be increased through it, rather than maximizing shareholders' value. Paying out the free cash flows as dividend would be better as this would maximize the stock price (Jensen, 1986). In the findings of Amihud & Lev (1981) and Black (1989), they argue that the risk of a firm is strongly correlated with its future employment and earnings potentials. They concluded from this that the risk faced by managers of conglomerate mergers is "employment risk". Consequently, managers may be risk averse by engaging M&A to diversify employment risk as may be affected, rather maximizing shareholders' value which is outside their portfolio (Weston, Siu, and Johnson, 2001).

Also, Mueller (1969) in his growth maximization model of M&A, observed that the size of the firm has an influence on managers' salaries, bonuses, promotions and social status. He emphasized that due to this, a return on investment that is lower than shareholders requirements is likely going to be accepted by managers. Managerial hubris can therefore be defined as an agency conflict that arises from the separation of ownership and control and the resulting conflict between the interest and motives of agents (managers) and the principals (shareholders) (Alchian & Demsetz, 1972; Jensen and Meckling, 1976).

A number of studies have argued whether managers' motive for M&A is to maximize shareholders' wealth or their own utility. For example, Lewellen & Rosenfeld (1985) studied 191 acquiring companies between a period of 1963 and 1981. In their conclusion, they document positive and significant relationships between the abnormal stock return and the percentage of acquiring firm's ownership. They further observed that managers with higher personal ownership in the firms would not like to succumb to M&A bid that will result in reduction of the shareholders' wealth of the acquirer.

Empirical test has been conducted on whether managers are acting to maximize their own utility or shareholder's wealth in a small number of studies. Lewellen & Rosenfeld (1985) concluded that significant and positive relationship exists between percentage of management ownership of companies and their abnormal stock returns from M&A. The study was on the stock returns of 191 acquiring firms during the period 1963-1981. Firth (1991) in his test to establish the relationship between executive reward and M&A, found that there is positive correlation between executive rewards and shareholders' value. In contrast, executives seem to benefit from M & A when shareholders' wealth is destroyed. The finding emphasized that managers seek to maximize their own utility at the expense of shareholders.

Suggestion was made to the following expectations of abnormal returns of the target and bidder firms as related to the three motives discussed earlier: the abnormal return to both bidders and targets will be influenced positively by synergy motives, whereas, hubris motives and agency motives would have negative influence on the bidders' abnormal return (Berkovitch & Narayan, 1993).

In the opposite, abnormal return of targets would be influenced positively if bidder's M&A is based on agency and hubris motives. Based on this inference can be drawn that targets may have higher abnormal returns than bidders during M&A announcements.

Numerous empirical evidences exist on drivers of profitability of wealth creation during merger and acquisition announcement. These factors includes the economic condition prevalent at the time of the announcement, whether the M&As is related or diversified, method of payment and premium paid by bidders, (Servaes 1991, Davidson and Cheng, 1997; Soufani, 2001; Georgen and Renneboog, 2004; Antoniou et al. 2008; Nurhazrina and Wee, 2011)

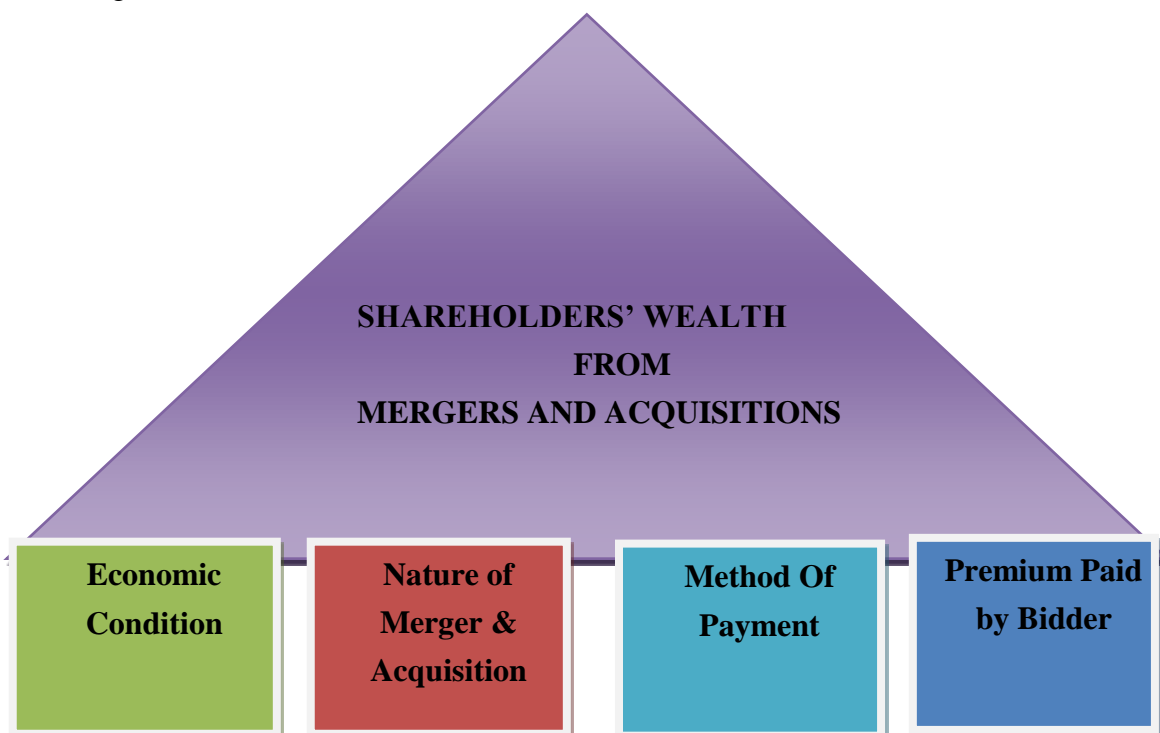


Fig 1: Influencing Factors on Shareholders Wealth in Mergers and Acquisitions

Source: Author's draft

### **Value Drivers in a merger**

Extant studies posit that there are three potent forces that drive value in M & A - management involvement, possibility of synergies and the significance of value investment (see Campa and Hernando, 2004; Bruner, 2002).

Empirical studies find that there exist positive relationship between shareholders' return of acquiring firm and share ownership by managers and employees. Leverage and management buyouts has also been found creating value for buyers. (Campa & Hernando, 2004). According to Bruner (2002), tax savings from debt and depreciation shield is not the only contributor to sources of returns; post-merger efficiency and operational improvement of the new management team are other beneficial factors. Managers are often committed wholly to the success of the M&A because of their huge wealth invested in the business (Healy et al., 1997; You et al., 1986).

Synergistic effect from economies of scale, cost efficiency and the elimination of duplicate activities are popular justifications for a merger. Findings in this school of thought are that: unrelated mergers tend to be more connected with poor performance than related mergers; the extent of relationship between the businesses of the buyer and the target is positively related with returns and that unrelated diversification can destroy value (Campa & Hernando, 2004; Comment and Jarrell, 1995 and Healy et al., 1992, 1997).

Diversified firms have also been observed to trade at a discount compared to their non-diversifying counterparts. While some researchers opine this is not due to the diversification of the firm, others argue in support of the existence of diversification discount. The most comprehensive evidence of this was provided in Lang and Stulz (1994) and Berger and Ofek (1995). Although the existence of diversification discount was supported by Campa and Kedia (2002), Villalonga (2004) and Maksimovic and Phillips (2002), they argue that there is possibility of the existence of the discount even when the value of the firm is being maximized.

Buyers in conglomerate deals were found, in the study carried out by Maquieira et al. (1998), to have negative but insignificant results whereas buyers in non-conglomerate deals have positive and significant returns. However, Houston et al. (2001) found that a significant relationship exist between the returns on bank mergers on its day of announcement and present value of forecasted cost savings

Finally, the possibility of generating positive return from investment is another factor worthy of consideration. Value investment is also likely to generate positive returns. A firm is said to be in value investment when it acquires a firm cheaply comparing the book value to the market value. Buyers of companies of high book to market value ratio were found by Rau and Vermaelen (1998) to have negative and significant cumulative abnormal returns in merger deals. On the contrary value oriented buyers were found to have positive and significant cumulative abnormal returns. Sellers prefer cash deals to stocks. Negative value creation is common with stock deals while cash deals has been found to have nil or positive cumulative abnormal returns (Asquith et al., 1987; Huang and Walkling, 1989; Travlos, 1987 and Yook, 2000).

The focus of the majority of the authors of drivers of value in M & A concentrated on drivers that are peculiar to a particular firm or business. Much has not been done on the impact of the value created on the industry as generated by different types of transactions in M&As. This paper therefore, focuses on the impact of value created from M&A on Nigeria banking industry as may be benefited by the shareholders.

### **Methodology and Research Design**

The number of banks in Nigeria was 89 before the consolidation exercise in 2005, and reduced to 23 after the exercise. However, according to the listing on Nigeria Stock Exchange it

further reduced to 20 due to further re-consolidation of some banks. However, five banks were judgementally selected based on the following criteria:

- i. They must have been in operation for at least 15 years. That fall within the scope of this study
- ii. They must fall within the 1,000 banks of World Bank ranking in 2011.
- iii. They must have the same name prior and after M&As deals
- iv. None of their managing directors were sacked by the CBN governor during the reformation.
- v. They must have their published annual account for 2012 available as at the time this research is conducted.

The banks selected are First Bank, Access Bank, UBA, Diamond Bank and Skye Bank. Zenith Bank met the minimum capital requirement without merging with any bank in 2005; led all the Nigerian banks in the World Bank ranking; emerged as the bank of the year in 2012; and also witness both the pre and post consolidation eras. The bank was therefore used for peer assessment to test the industrial effect of consolidation and enhanced the validity of result of selected banks (Pillof, 1996).

Published annual accounts of the selected banks were analysed. A 15 year data was used to have a comparative analysis of the two eras which makes a total of 45 observations. This follows the model of Olowoniyi and Ojenike (2012) and Rahim, and Pok (2013). The post-consolidation era (2006 to 2012) is a 7 year period. Using 2005 as the base year, a 7 year pre-consolidation era (1998-2004) will also be necessary to have a balanced analysis.

Various indices have been used by researchers in measuring shareholders value/ wealth created by M&A deals. The most widely used index is cumulative Average Abnormal Returns (CAAR) method (Rahim, and Pok, 2013; Flugt, 2009; Amporn, 2009 and Schiereck et al, 2009; Georgen and Renneboog, 2004; and Campa and Hernado, 2004). This is an individualistic and comparative approach between the target firm and the acquirer firm in order to assess/measure/evaluate the benefits of the merger. The approach is good where it is the initiative of management of the firms to merge. It is inappropriate to Nigerian banking system because the CBN policy affects the industry as a whole which directors had to obey. Therefore, adopting CAARs model to Nigerian banking system may be complex and biased.

This study adapted profitability ratio used in Ikpefan (2012), Okpanachi (2011) Rhodes, (1998), Berger and Humphrey (1991) and Chamberlain (1998) who assess banks' efficiency from M&A deals by analyzing the Return on Equity (ROE) and/or Return on Asset (ROA) before and after merger and acquisition. However an innovative approach is adopted in framing the ratio in such a way that will reflect the value to shareholders. Shareholders' value in the context of this study is viewed as the yield in profits from shareholders fund invested. Therefore, the synergy (S) - value from merger, by making pre- and post-merger comparisons of the index as defined below.

Value to Shareholders (VTS) is defined as: Profit Attributable to Shareholders (PATS) Shareholders' Fund (SHF)

### **Results and Summary of findings**

The significant and strong positive relationship between shareholders' fund and profit attributable to shareholders in the sampled banks (except in Diamond bank) shows that the consolidation exercise is fruitful and of good impact on banks. However, further analysis shows that the strength of relationship is lower in post-acquisition period than in pre-acquisition period thus negating the theory of synergy. The model bank used showed the same result, this indicates that the industry is affected in the same way. The summary of the analysed data is presented below.

Table 1: Results

Statistical Measure	Zenith Bank	First Bank	Access Bank	UBA	Diamond Bank	Skye Bank
Correlation Co-efficient (r)	0.907	0.637	0.77	0.619	0.15	0.651
Co-efficient of Determination (r <sup>2</sup> )	0.823	0.405	0.594	0.383	0.022	0.424
Pre consol. R	0.9937	0.9276	0.7488	0.7827	0.7729	0.8232
Post consol r	0.8046	0.4517	0.6768	0.4214	0.7685	0.4129
Pre consol r <sup>2</sup>	0.9874	0.8604	0.5607	0.6126	0.5974	0.6777
Post consol r <sup>2</sup>	0.6474	0.2040	0.4581	0.1776	0.5906	0.1705
Degree of Freedom	1,13	1,13	1,11	1,12	1,12	1,9
F-cal (ANOVA)	60.483	8.861	16.063	7.436	0.276	6.616
F-Tab @ 5% Sig	4.67	4.67	4.84	4.75	4.75	5.12
P-value	0.000	0.011	0.002	0.018	0.609	0.030
Decision on H0	Reject	Reject	Reject	Reject	Accept	Reject

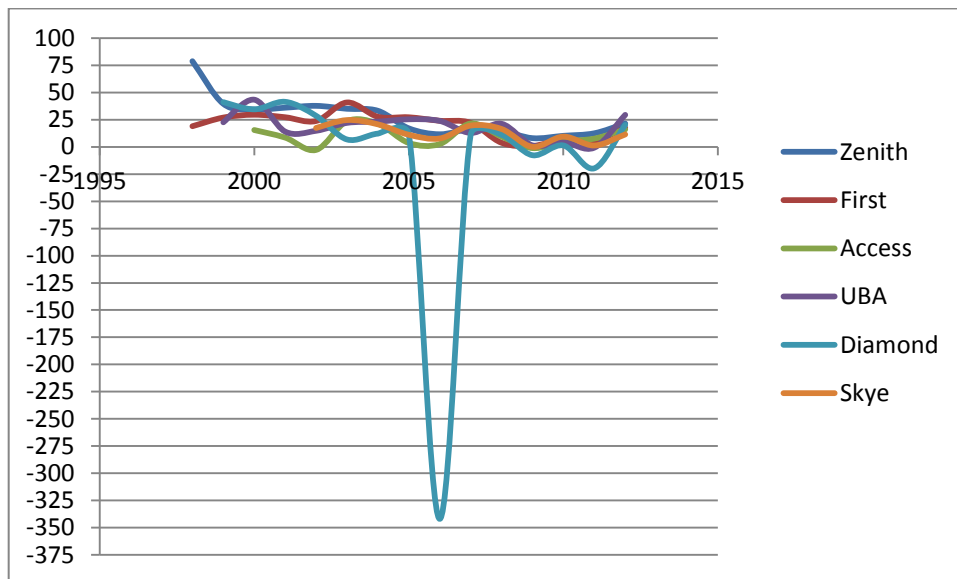
The correlation of EPS with year is stronger also in all selected banks in the pre-consolidation era than in the post-consolidation era. They all have positive relationship except UBA that has its EPS reducing as the year increases. The findings of Olagunju and Obademi (2012) confirm this; that there is significant difference in pre-acquisition EPS and post-acquisition, also shareholders' value is not as high as that of pre-acquisition period.

The trend studied also showed a declining direction. However, the line charts show a general upward movement of banks studied at the end of 2012. Does that mean that M&A is a curse to Nigerian banking sector? The answer to this question is no. The consolidation exercise, from the analysis, has impacted the banking sector in a good way but yet to yield its strength to the shareholders. These results are confirmed by the findings of Akinbuli and Kelilume, (2013); Virani, (2009) and Vardhana (2001).

Table 2: Value to Shareholders in Percentage

Year	Value to Shareholders in Percentage (%)					
	Zenith	First	Access	UBA	Diamond	Skye
1998	78.6825	18.9552				
1999	39.5383	26.9033		22.5329	41.0634	
2000	34.329	29.4923	15.4394	43.3206	34.4503	
2001	35.95	27.1767	8.4875	13.9958	41.3607	
2002	37.6531	23.7413	-2.829	14.736	28.4998	17.3405
2003	34.9668	40.7687	23.5518	22.0119	6.7695	24.5944
2004	33.1185	27.6	21.2121	23.1659	12.1321	20.657
2005	16.9667	27.16	3.5674	25.3099	11.3075	11.0861
2006	11.5458	23.9572	2.5507	23.7973	-341.872	7.6661
2007	16.2995	22.0465	21.4303	12.7839	10.8745	19.5125
2008	14.788	3.7252	9.3894	21.1484	10.9789	16.3854
2009	7.9589	0.8399	-1.173	1.3084	-7.707	0.00908
2010	10.1314	6.8034	4.8005	4.0925	1.2675	9.4137
2011	12.4561	5.3099	7.549	-0.761	-19.718	1.2271
2012	21.4197	17.3941	16.016	29.3645	20.1451	11.3695

Fig 3- Combined value to shareholders in relation to years.



## Conclusions

The US mortgage crises of 2007 and 2008 affect global financial system. Therefore it must have also contributed to the lower post-acquisition value attributable to shareholders of Nigerian banks (Akinbuli and Kelilume, 2013). M&A are expected to lead to performance gains that will maximize shareholders' wealth. Against theoretical framework, the analysis show lower value to shareholders in post-acquisition period compared to the pre-acquisition period. However, there is evidence of strong and positive correlation between the profit attributable to shareholders and shareholders' funds of the banks studied.

The reason behind the negative t-test and mean value of value to shareholders could be traced to the 'fire-brigade' approach adopted in the consummation of the scheme in 2005. The poor state and crises in the banking sector must have increased the associated costs of acquisition. If the consolidation exercise was consummated in a situation when the banking system is fundamentally strong, the associated costs would have been lower and profit would have been greatly improved.

Although it is the first research to analyse the Nigeria banking system with such a long year with a unique but comparable methodology to arrive at the conclusion as to whether shareholders' wealth improve post consolidation or not. Not all banks that met the sampling criteria were having their financial data for 1998 accessible. The results, therefore is a representation of Nigerian banking sector and may not be of general application.

Another limitation of the study is that annual report used might be subject to earning management/creative accounting which may impair the judgement from it. Also, of important relevance is that financial statements are prepared based on historical cost convention. This may not portray the true market worth of the firm. However since market prices are always unstable and depend on the market forces, historical cost can be the next best alternative.

Limited research exists in M&As in Nigerian Banking industry. Due to this, there is existence of some research vacuum that call for further investigation. The empirical method adopted in this study is the first that considers value to shareholder between the post-acquisition period, 2006 to 2012 and pre-acquisition period, 1998 to 2004; using adapted ROE ratio in defining shareholders' value. Further investigation is needed on the impact of the size of merging firm on the magnitude of shareholders' wealth. Also global financial system is becoming more integrated, it will also worth the effort to know the impact of globalization on shareholders wealth in the post-acquisition period. Also the question; does cross-border M&As add value to shareholders? is worth answering.

Although the intention of the CBN is to use merger and acquisition is to enhance the strength, efficiency and competitiveness of the banking sector, M&A is just a step in the journey, therefore cannot achieve these alone. Supporting policies and positive managerial efforts such as encouragement of professionalism among employees and promotion of effective corporate governance will help the banks in overcoming both environmental and globalization challenges have to be in place.

The focus of the consolidation exercise was centralised on increasing the capital base. The findings from this study show that huge capital may not necessarily yield huge profit. Although the consolidation exercise curb illiquidity problems in banks and enhances diversification and survival; the management of banks should also learn to be pro-active in their operations by developing differentiation strategy and doing best what they can do best. Also, in order to compete favourably both locally and globally, best brains should be match with best brand. This will impact on the profitability positively and enhance shareholders' value.

It is likely that better return will be obtained where merger is driven by market forces and not by force (Kumar, 2002). Management of the banks can initiate further M&A among themselves with a prepared mind and with the intention of ensuring maximization of shareholders' wealth. The 2005 consolidation exercise is more in national interest to safe the industry from collapsing and being an eyesore to Nigeria among the comity of nations. Therefore, it is a means to an end and not an end in itself. Internal efforts within the industry among the stakeholders cannot be compromised. Government have laid the track, the responsibility of profitability and survival lies with individual bank.

## References

- Adereti A, Sanni MR, (2007). The Effects of Mergers and Acquisitions on Corporate Performance. *Knowledge. Review*, 15(9): 81-87.
- Akinbuli, S. F. and Kelilume, I. (2013). The Effects of Mergers and Acquisition on Corporate Growth and Profitability: Evidence from Nigeria, *Global Journal of Business Research*, Volume 7, Number 1.
- Amedu, S. (2004). Corporate Takeover, Acquisition and Merger. *The Nigerian Stockbrokers*, The Official Journal, Chartered Institute of Stockbrokers, January-March.
- Amihud, Yakov, and B. Lev (1981). "Risk Reduction as a Managerial Motive for Conglomerate Mergers," *Bell Journal of Economics*, 12, pp.605-617.
- Amporn, S., (2009), Shareholder wealth effects: successful vs unsuccessful bidders: *Journal of Accounting, Business and Management*, Vol 16 No 1, pp 45-64.
- Antoniou, A., Arbour, P. & Zhao, H. (2008). How much is too much: are merger premiums too high? *European Financial Management*, Vol. 14 No. 2, pp 268-87.
- Asquith, P., Bruner, R. and Mullins, D. (1987) 'Merger returns and the form of financing', *Proceedings of the Seminar on the Analysis of Security Prices*, Vol. 34, pp. 115–146.
- Assaf, G. A., Barros, C., and Ibiwoye, A. (2012) Performance Assessment of Nigerian Banks pre and post consolidation: Evidence from a Bayesian Approach, *The Service Industries Journal*, 32(2). March, pp 215-229.
- Beitel, P., Schiereck, D. and Wahrenburg, M. (2004). Explaining M&A Success in European Banks. *European Financial Management*, 10 (1), 109-139.
- Berger, A.N. and Humphrey D.B., (1992), "Megamergers in Banking and the Use of Cost Efficiency as an Antitrust Defense", *Anti-Trust Bulletin* 37, p.541-600.
- Berger, P. G. and Ofek, E. (1995) 'Diversification's effect on firm value', *Journal of Financial Economics*, Vol. 37, pp. 39–65.
- Berkovitch, E. and M. Narayanan, 1993, Motives for takeovers: An empirical investigation. *Journal of Financial and Quantitative Analysis*, 28, 347-362.
- Black, B. (1989): "Bidder overpayment in takeovers", *Stanford Law Review*, 41, pp. 597-660.
- Bruner, R., (2002) 'Does M&A pay? A survey of evidence for the decision-maker', *Journal of Applied Finance*, Vol. 12, pp. 48–68.
- Bruner, R.F. (2004), *Applied Mergers & Acquisitions*, John Wiley & Sons, Hoboken, New Jersey.
- CAMA (1990). *Companies and Allied Matter Act of 1990*
- Campa, J. M and Hernando, I. (2004) Shareholder Value Creation in European M&As. *European Financial Management Journal*. Vol 10, Issue 1.
- Campa, J. M. and Kedia, S. (2002) 'Explaining the diversification discount,' *Journal of Finance*, Vol. 57, pp. 1731–61.
- Carbo, S., & Humphrey, D. B. (2004), Predicted and Actual Costs from Individual Bank Mergers. *Journal of Economics and Business*, 56, 137–157.
- Cavallo, M., & Majnoni, G. (2002), Do Banks Provision for Bad Loans in Good Times? Empirical evidence and policy implications. *World Bank Policy Research Working Paper*, No. 2619).



- Cavallo, L. And Rossi, S.P. (2001). Scale and Scope Economies in the European Banking Systems. *Journal of Multinational Financial Management*, 11, 515-531.
- Chamberlain, S.L., (1998), "The Effect of Ownership Changes on Subsidiary – Level Earnings", *Kluwer Academic*, Boston MA, p137-172.
- Comment, R. and Jarrell, G., (1995) 'Corporate focus and stock returns', *Journal of Financial Economics*, Vol. 37, pp. 67–87.
- Davidson, W.N and Cheng, L.T. (1997), Target firm returns: Does the form of payment affect abnormal returns? *Journal of Business Finance and Accounting*, Vol. 24 Nos 3-4, pp. 465-79.
- Davidson, I. and Ismail, A. (2005). Further analysis of mergers and shareholder wealth effects in European banking. *Applied Financial Economics*, 15, 13-30.
- Davidson, I. and Ismail, A. (2007). The Determinants of Target Returns in European Bank Mergers. *The Service Industries Journal*, 27 (5), 617-634.
- Di'az, B., Garcí'a, M., & Sanfilippo, S. (2004), Bank Acquisitions and Performance: Evidence from a Panel of European Credit Entities. *Journal of Economics and Business*, 56, 377–404.
- Drake, L., & Hall, M. (2003), Efficiency in Japanese Banking: An Empirical Analysis. *Journal of Banking and Finance*, 27, 891–917.
- EconomyWatch (2010). History of Mergers and Acquisitions. Available online on <http://www.economywatch.com/mergers-acquisitions/history.html> retrieved on June 18, 2013.
- Esho, N. (2001). The determinants of cost efficiency in cooperative financial institutions: Australian Evidence. *Journal of Ba*
- Firth, M., (1980) 'Takeovers, shareholder returns, and the theory of the firm', *Quarterly Journal of Economics*, pp. 235–60
- Georgen, M. And Renneboog, L., (2004), Shareholders Wealth Effects on European Domestic and Cross Border Take Over bids, *European Financial Management*, Vol. 10 No 11, pp 9-45.
- Healy, P., Palepu, K. and Ruback, R., (1992). 'Does corporate performance improve after mergers?' *Journal of Financial Economics*, Vol. 31, pp. 135–75.
- Healy, P., Palepu, K. and Ruback, R. (1997), 'Which takeovers are profitable: strategic or financial?' *Sloan Management Review*, Vol. 38, pp. 45–57.
- Higgins, R. C. and Schall, L. D., (1975). Corporate bankruptcy and conglomerate merger, *Journal of Finance*, 30(1), pp. 93-113.
- Houston, J., James, C. and Ryngaert, M., (2001) 'Where do merger gains come from? Bank mergers from the perspective of insiders and outsiders', *Journal of Financial Economics*, Vol. 60, pp. 285–331.
- Huizinga, H.P., Nelissen, J.M., and Vander Vennet, R. (2001). *Efficiency effects of bank mergers and acquisitions in Europe* ( Tinbergen Institute Discussion paper 2001- 088/3).
- Ikpefan, O. A., (2012). Post-Consolidation Effect of Mergers and Acquisitions on Nigeria Deposit Money Bank. *European Journal of Business and Management*. Vol. 4, No 16 pp 151- 162

- Jensen, M.C., (1988). "The Free Cash Flow Theory of Takeovers: A Financial Perspective on Mergers and Acquisitions and the Economy" in The Merger Boom, Federal Reserve Bank of Boston, 31, pp.102-143
- Jensen, M. C., (1986). "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers," American Economic Review, 76, 323-29.
- Kim, E.H. and J. McConnell (1977): "Corporate Merger and the Coinsurance of Corporate Debt", *Journal of Finance*, 32, pp. 349-365.
- Kumar, S., (2002), "Bank Mergers: Why They Don't Always Work", *The Edge Daily*, March 11.
- Lewellen, C. L. and A. Rosenfeld (1985), Merger decisions and executive stock ownership in acquiring firms. *Journal of Accounting and Economics*, 7, pp. 209-31.
- Lewellen, W. G. (1971), A pure financial rationale for the conglomerate merger, *Journal of Finance*, 27, pp. 521-545.
- Maksimovic, V. and Phillips, G (2002). 'Do conglomerate firms allocate resources inefficiently across industries?' *Journal of Finance*, Vol. 57, pp. 721-67.
- Maquieria, C., Megginson, W. and Nail, L., (1998) 'Wealth creation versus wealth redistributions in pure stock-for-stock mergers', *Journal of Financial Economics*, Vol. 48, pp. 3-33.
- Mueller, D. C. (1969): A theory of Conglomerate Mergers", *Quarterly Journal of Economics*, 83, pp. 643-659
- Muhammed, R., (2005). Understanding Mergers and Acquisitions. *Business Day Newspaper*, February 17.
- Okpanachi, J., (2011), Comparative Analysis of the Impact of Mergers and Acquisitions on Financial Efficiency of Banks in Nigeria. *Journal of Accounting and Taxation*. Vol 3(1) May, pp 1-7 Available online at <http://www.academicjournals.org/JAT>
- [Olagunju, A., and Obademi. O., \(2012\). An Analysis of the Impact of Merger and Acquisitions on Commercial Banks Performance in Nigeria. Research Journal of Finance and Accounting. Vol 3, No 7. Available online at: \[www.iiste.org\]\(http://www.iiste.org\) > Home > Vol 3, No 7](#)
- Olowoniyi, A.O. and Ojenike J.O. (2012). Effect of Mergers and Acquisitions on Returns to Shareholders of Coglomerates in Nigeria. *Research Journal of Finance and Accounting*. Vol 3, No 7, 2012. ISSN 2222-1697 (Paper) ISSN 2222-2847 (Online) at [www.iiste.org](http://www.iiste.org)
- Rahim, N. M and Pok, W.C. (2013). Shareholder Wealth Effects of M&As: the third wave from Malaysia. *International Journal of Managerial Finance*. Vol. 9, pp 49-69. Available online at [www.emeraldinsight.com/1743-9132.htm](http://www.emeraldinsight.com/1743-9132.htm).
- Rhodes, S.A., (1998), "The Efficiency Effects of Bank Mergers: An Overview of Case Studies of Nine Mergers", *Journal of Banking and Finance* 22, p.273-291.
- Sathye, M. (2001). X-Efficiency in Australian Banking: An Empirical Investigation. *Journal of Banking and Finance*, 25, 613-630.
- Schiereck, D., Sigl-Grub, C., and Unverhau, J. (2009). Investment Bank Reputation and Shareholder Wealth Effects in Mergers and Acquisitions. *Journal of International Business and Finance*. 23, pp 257-273.
- Servaes, H. (1991). Tobin's Q and Gains from Takeovers, *Journal of Finance*, Vol 46, No 1, pp 209-19.

- Seth, A. (1990). Value Creation in Acquisitions: A Re-examination of Performance Issues. *Strategic Management Journal*, 11, pp. 99-115.
- Soludo, C., (2004). Consolidating the Banking Industry to meet Development Challenges. Discussion Paper, <http://www.thisdayonline.com/business>.
- Soufani, T.T.K. (2001). Wealth effects of takeovers in merger activity eras: empirical evidence from UK, *International Journal of Economics of Business*, Vol 8 No 3, pp 365-77
- Trautwein, F. (1990). Merger Motives and Merger Prescriptions. *Strategic Management Journal*, 11, pp. 283-295.
- Travlos, N., (1987). Corporate Takeover Bids Method of Payment, and Bidding Firms' Stock Returns', *Journal of Finance*, Vol. 42, pp. 943-63.
- Villalonga, B. (2004). 'Diversification Discount or Premium? New evidence from BITS establishment level data', *Journal of Finance*, Vol. 59, 2004.
- Watson, D. & Parker J. (2013). *Corporate Finance: Principles and Practice*, 6<sup>th</sup> Edition, FT Prentice Hall.
- Weston, J.F, Mitchell, M.L. & Mulherin, J.H. (2004) *Takeovers, Restructuring and Corporate Takeovers* New Jersey, Pearson Education Inc.
- Weston, J. and S. Weaver (2001). *Mergers and acquisitions*, The McGraw-Hill Executive MBA Series, McGraw-Hill.
- Weston, J. F., M. L. Mitchell and J. H. Mulherin (2004). *Takeovers, restructuring, and corporate governance*. New Jersey, Pearson Education, Inc.
- Weston, J.F; Siu, J.A, & Johnson, B.A. (2001). *Takeovers, Restructuring, and Corporate Governance*, 3ed, Upper Saddle River, Prentice Hall.
- Yook, K. C., (2000). 'Larger Return to Cash Acquisitions: Signalling Effect or Leverage effect?' *Working Paper*, John Hopkins.s
- You, V. *et al.*, (1986) 'Mergers and Bidders' Wealth: Managerial and Strategic Factors,' in Lacy Glenn Thomas III (ed.). *The Economics of Strategic Planning: Essays in Honor of Joel Dean*, Lexington: Lexington Books, pp. 201-21.
- Zalewski, D.A., (2001). "Corporate takeovers, fairness, and public policy", *Journal of Economic Issues*, 35 (2), pp. 431- 437.

### Websites

- [http://www.zenithbank.com/Annual%20report/FinancialStatementFull\\_03042013.pdf](http://www.zenithbank.com/Annual%20report/FinancialStatementFull_03042013.pdf)
- [http://www.africanfinancials.com/Report.aspx?afr\\_year=2003&CountryDOMAIN=ng&CshortName=UBA](http://www.africanfinancials.com/Report.aspx?afr_year=2003&CountryDOMAIN=ng&CshortName=UBA)
- [http://46.38.182.253/annualreport/2012/downloads/Firstbank\\_Holdings\\_Abridged2012\\_V2.pdf](http://46.38.182.253/annualreport/2012/downloads/Firstbank_Holdings_Abridged2012_V2.pdf)
- <http://46.38.182.253/LinkClick.aspx?fileticket=RVA7ZUBwyyU%3d&tabid=486>
- <http://46.38.182.253/LinkClick.aspx?fileticket=2iuyWBKWwic%3d&tabid=486>
- <http://www.vanguardngr.com/2011/07/9-nigerian-banks-make-top-1000-world-banks-ranking/>

# A Comparative Study on the Fermentability of Camel and Cow's Milk by a Symbiotic Blend of Lactic Acid Cultures

---

**Amin O. Igwegbe**

*Department of Food Science and Technology, Faculty of Engineering  
University of Maiduguri  
P.M.B. 1069 Maiduguri, Nigeria*

**Charles A. Negbenebor**

*Department of Food Science and Technology, Faculty of Engineering  
University of Maiduguri  
P.M.B. 1069 Maiduguri, Nigeria*

**Elizabeth C. Chibuzo**

*Department of Food Science and Technology, Faculty of Engineering  
University of Maiduguri  
P.M.B. 1069 Maiduguri, Nigeria*

## **Abstract**

The present study was carried out to assess the ability of a blend of symbiotic lactic acid cultures, O-CH:143 (mainly homo-fermentative) and B-CH:40 (mainly hetero-fermentative), to ferment the dromedary milk in comparison with that of the cow's milk under the same experimental conditions, as determined by the rate of acid production (pH and titratable acidity, TA). Significant variations ( $P \leq 0.05$ ) between the two fermenting milk samples were observed in the rate of acid production by the blend of the lactic acid cultures. The rate was higher in the cow's milk than in the camel's, though the fermentability of the camel milk was improved by the blend of the cultures. The study recommended further research aimed at the isolation and identification of the natural constituents of camel milk that might be responsible for the low rate of acid production during a controlled fermentation of the camel milk.

**Key words:** dromedary milk, symbiotic lactic culture, pH, titratable acidity.

## Introduction

Man has evolved in close contact with Nature, and the first food Nature provided for man was milk. Throughout most of the history of man, the sole source of milk was from women's mammary glands. In early times, when Nature failed to bless the newborn child with a lactating mother, the baby either suckled another woman or died. Then as man domesticated animals, milk from other mammals became available to provide essential nutrients to man (Campbell and Marshall, 1975).

Various species of mammals have been used for dairy purposes throughout the world (Dilanyan, 1959). However, in Nigeria the cow provides essentially all the fluid milk. There is very limited knowledge about the production and consumption of camel milk in Nigeria, despite the availability of this animal in appreciable number, approximately 18,000 heads (FAOSTAT Database, 2001) spread in the northern part of the country, and high nutritional value of its milk (Newman, 1975; Shalash, 1984).

There are many reasons why researches on improvement of camel production and utilization of camel milk must be stepped-up (FAO, 2001). This is clear when we consider that one of the biggest problems confronting mankind today is malnourishment. Report from various countries indicate that camel milk can certainly play a far more important role in the prevention of malnutrition than milk from other animal species — cows, goats, sheep, horses, etc. (Knoess, 1977; Yagil, 1982; Igwegbe et al., 1992a; FAO, 2001). For instance, it is well established fact that growing and raising foodstuffs for the rapidly increasing human population is especially precarious in the hot and arid zones of the world, the very areas where the camel is one of the few animals that not only survive, but also benefit man (Knoess, 1977; Yagil, 1980 and 1982; FAO, 2001). In those areas, the inhabitants are mainly pastoral and the camels roam according to the range conditions. In the dry season, the camels are reportedly watered once in every 10 - 20 days, compared with 3 – 8 days for sheep and goats and every 2 – 3 days for the cattle (Yagil, 1980; Mal et al., 2006). In addition to this, a camel under this condition can be expected to yield about 4kg of milk daily as compared with 0.5 – 1.5kg for a cow in the same area (Alwan et al., 2014).

A most interesting phenomenon was discovered when research was carried out on the intestinal lactase concentration in various ethnic groups that consumed camel milk in Saudi Arabia (Cook and Al-Torki, 1975). The adult Arabs were found to have the highest lactase levels due to their regular consumption of the camel milk, demonstrating the safety of camel milk for people with lactose intolerance (Cook and Al-Torki, 1975).

In comparison with other milks, camel milk is high in protein (Newman, 1975; Elagamy, 2000) and has a high concentration of volatile acids that are essential for human nutrition (Rihab et al., 2007). The milk contains short-chained fatty acids and is rich in chlorides, phosphates, magnesium, sodium, lactose, calcium and vitamin C, making it an excellent meal for children, and an alternative to fruits and vegetables which are always in short supplies in desert and arid regions (Johnson and Abaraham, 2005).

Reports from various studies indicate that camel milk has many medicinal properties (Mal et al., 2006a); it contains anti-microbial (Benkerroun et al., 2004), anti-coagulant and anti-toxic compounds which are used as a remedy by many desert dwellers (Shalash, 1984; Magjeed, 2005). It has been used traditionally as a cure for diabetes, bronchial asthma, kidney diseases and immunity deficiencies (Shabo and Yagil, 2005; Mal et al., 2006). This last property might be very useful in the treatment of HIV and AIDS cases.

Finally, the camel can subsist on forage detested by other animals and are unaffected by long periods without drinking water; and milk production is relatively unaffected by lack of water,

however, the smell, taste and content of the milk are reported to be affected by the type of forage as well as by lack of water (Alwan et al., 2014).

Despite the expected roles of the camel milk in human nutrition, it is widely speculated that the composition of the camel milk does not allow for making some of the accepted products that are easily made from cow, sheep and goat milks. Nevertheless, results of many trials from other countries indicate that milk products can be made from camel milk (FAO, 2001; Al-haj et al., 2010; Alwan and Igwegbe, 2013) and that the milk itself could be used for purposes other than fresh consumption—especially after mixing with milk from various animals (Alwan et al., 2014).

An earlier attempt by Igwegbe et al., 1992a, to carry out a controlled fermentation of camel milk using a single strain of lactic acid culture, did not yield a satisfactory result. The purpose of the present study is therefore, to investigate the possibility of achieving a satisfactory fermentation of the camel milk with a symbiotic blend of lactic cultures. The success in this will definitely prepare an enabling condition for the preparation of other milk products from Nigerian camel milk.

## **Materials and Method**

### **Collection of the Milk Samples**

Samples of fresh camel and cow's milk were purchased directly, from pools of the milk, from herds owned by nomads around Maiduguri Town (Alua, Kasuwa Shani, Gidan Madara, Auna and the University of Maiduguri Animal Farm). The samples were collected into clean plastic containers (10 liters). Equal volumes of whole camel and cow's milk were purchased and transported to the Food Science and Technology and National Agency for Food, Drug Administration and Control (NAFDAC) laboratories in iced coolers, for the experiments which were carried out within 12 – 24 hours of the collection of the samples. The experiments were conducted on the pooled samples of camel or cow's milk.

### **Chemical Analysis**

Fresh milk samples were immediately analyzed in the laboratory for proximate composition—moisture, fat, protein, lactose, ash and total solids (TS), in addition to the measurement of the pH and titratable acidity (TA), in accordance with the procedures outlined in Atherton and Newlander, 1981. Protein was determined through the quantification of the nitrogen content by the standard Micro-Kjeldahl method (AOAC, 2000) and multiplying by a conversion factor of 6.38 to arrive at protein content. Ash was determined following the procedures of Igwegbe et al., 2013; the lactose content was determined by subtracting the sum of protein, fat, ash and moisture from 100; the pH was measured with a pH meter (Model WTW410D8120, Welheim, German), while the titratable acidity was determined by titration of 9ml of the fresh or fermenting milk with 0.1N NaOH in the presence of phenolphthalein indicator (Atherton and Newlander, 1981). The rate and amounts of acid production were measured simultaneously in both the fermenting camel and cow's milk.

### **Propagation of the cultures**

Multiple strain, mixed type, lyophilized, mesophilic lactic cultures, O-CH:143 (mainly homo-fermentative) and B-CH:40 (mainly hetero-fermentative) Hansen's Laboratorium, Denmark, were used at the ratio of 1:1 in the culture preparations. Reconstituted cow milk powder was used as a propagation medium for the mother culture at room temperatures of 27 – 29°C for 24 hours. Many transfers of 2% (v/v) were made and incubated at the same temperatures and time, to make the daughter cultures more active, before the culture was finally deployed in the fermentation experiments.

### **Preparation of the Fermented Milk and measurement of pH and Titratable Acidity (TA)**

Ten (10) liters of fresh whole camel or cow's milk were batch pasteurized separately, by placing them in a container filled with water and heating, with continuous stirring, until all the particles of the milk attained the temperature of 63 – 65.50C, and then holding the milk at this temperature for 30 minutes. The main purpose of this heat treatment was to get rid of pathogenic bacteria and any milk enzyme that might interfere with the fermentation process. At the end of the pasteurization period, the pasteurized milk was cooled to 37 - 400C before inoculating each batch with 2% (v/v) of a 24 hour's old daughter culture. The inoculated milk samples were vigorously shaken before distributed into ten-250ml sterile conical flasks under strictly sterile conditions. The conical flasks containing the inoculated samples were then transferred to an incubator maintained at 37 – 400C for 6 – 18 hours. This temperature is a compromise between the optimums for the two micro-organisms contained in the culture. The changes in pH and rate of acidity development (a measure of TA), were determined from zero time to first five hours, and at the end of the 18 hours of the incubation period. This was done by removing one conical flask containing the camel or cow's milk at an hourly intervals and titrating 9ml of the fermenting milk with 0.1N NaOH in the presence of phenolphthalein indicator (Atherton and Newlander, 1981). Three titrations were done on each fermenting milk sample at an hourly interval and taking an average reading as a measure of the pH or TA at that interval.

### **Statistical Analysis**

Statistical analysis of the data obtained in this study was carried out by the calculation of the means and standard deviations. The test for significance between means of the camel and cow's milk samples was determined through T-tests at 5% levels of significance (Montgomery, 1976).

### **Results and Discussion**

The results of the chemical analysis of the fresh camel and cow's milk samples used in this experiment are presented in Table 1. The average pH and TA of the camel and the cow's milk on arrival to the laboratory was 6.57 and 6.70, and 0.16 and 0.17, respectively. It can be observed from the result that the proximate compositions of the milk from the two animal sources are almost similar (Table 1). Also, the results of the determination of the amount and rate of acid production in the two milk samples, as measures of pH and titratable acidity (TA) during the fermentation process, are given in Table 2. Significantly less culture activities ( $P \geq 0.05$ ) were observed in camel milk samples inoculated with the symbiotic lactic acid cultures than that in the cow's milk. Extended lag phase, indicated by lack of appreciable increase in both the pH and TA production in the camel milk, was observed in fermenting camel milk compared with that of the cow's, during the first two hours of the fermentation process (Table 2). This extended lag phase may be as a result of the presence of antimicrobial factors in camel milk such as transferrin, lactoferrin, lysozymes and lactoperoxidase systems, thought be in higher concentrations in camel milk than that of the cow's (IDF, 1985; EL-Agamy et al., 1992; El-Agamy, 2000; Benkerroun et al., 2004;). This is however, an area that requires further investigation. These factors may also be responsible for the higher pH ( $4.45 \pm$ ) and lower TA ( $0.73 \pm$ ), observed in the fermented camel milk sample at the end of the 18 hours of the fermentation period, and compared with the amounts ( $3.15 \pm$ ) and ( $0.89 \pm$ ), respectively, obtained in the cow's milk at the end of the fermentation period (Table 2). Moreover, the characteristic yoghurt flavour was perceived from both samples at the end of the fourth hours of the fermentation, though the flavour was stronger in cow's milk than that of the camel; and the flavour remained stronger as the fermentation progressed. This was also associated with a remarkable increase in percent TA in all the samples especially from the fifth hour to the end of the eighteenth hour (Table 2). Acidity measurements are usually used to monitor processes such as cheese-making and yoghurt-making. Proper acid production during the processes depends on the viability and ability of the lactic cultures

to ferment the milk sugar — lactose. Compared with the cow's milk, the consistency of the fermented camel milk was also observed to be thinner. At the end of the fermentation process, precipitates in the form of small pieces of soft materials were formed in camel milk rather than

**Table 1: The Mean Composition (%) of the Fresh Camel and Cow's Milk used in this Study**

Component*	Camel Milk (%)	Cow's Milk (%)
Moisture	91.50±0.39a	89.43±0.33b
Fat	2.57±0.22a	3.14±0.22b
Protein	2.89±0.23	2.97±0.05
Lactose	4.87±0.34a	4.42±0.19b
Ash	0.77±0.03	0.81±0.14
TS	12.43±0.11a	11.44±0.29b

\*In any row, means bearing different superscripts are significantly different ( $P \leq 0.05$ ).

**Table 2: pH and Titratable Acidity (TA) of the Camel and Cow's Milk incubated at 37 – 400C with a Symbiotic Blend of Lactic Acid Cultures**

Fermentation Time (Hour)	Camel Milk*		Cow's Milk*	
	pH	TA	pH	TA
0	6.47±0.12a	0.18±0.02c	6.57±0.06a	0.20±0.08c
1	6.47±0.11a	0.18±0.02c	6.33±0.13b	0.25±0.01d
2	6.26±0.08a	0.21±0.02c	5.81±0.11b	0.32±0.03d
3	5.98±0.08a	0.29±0.15c	5.02±0.05b	0.49±0.11d
4	5.43±0.23a	0.37±0.04c	4.85±0.09b	0.56±0.05d
5	5.11±0.09a	0.48±0.06c	4.16±0.09b	0.63±0.05d
6	4.96±0.11a	0.56±0.12c	3.79±0.03b	0.76±0.09
18	4.45±0.03a	0.78±0.04c	3.15±0.05b	0.88±0.02c

\*In row, means bearing different superscripts are significantly different ( $P \leq 0.05$ ).

the normal coagulum observed in the fermented cow's milk. This could also be as result of some special properties of the camel milk, including the high contents of antimicrobial agents such as mentioned earlier in this study. The results of the present study are however in agreement with those obtained in similar studies in various countries including those of Igwegbe et al; 1992a, Abdelgadir et al., 1998; Attia et al., 2001, Rihab et al., 2008. The rate of acid production in fermenting camel milk observed in the present study using the symbiotic blend of the lactic acid culture was however faster than the rate recorded by Igwegbe et al., 1992a using a single lactic acid culture. The quality of the final product was also improved by the use of the symbiotic blend of the lactic. Fermented camel milk showed higher pH (4.45±0.03) and lesser titratable acidity (0.78±0.04) than that of the cow's milk, 3.15±0.05 and 0.88±0.02, respectively, at the end of the 18 hours of the fermentation process. Clear and clean curd with a thin layer of whey was observed in cow's milk samples at the end of the fermentation process, whereas that of the camel was just like slurry. This study has, however, indicated that the fermentation of the camel milk could be improved by using combination of the lactic acid cultures.

## Conclusion

In conclusion, the composition of dromedary milk is excellent from a nutritional point of view. Moreover, the present study has indicated significant variations between the activities of the symbiotic lactic cultures as determined by the rate of acid production in both the camel and cow's milk. The variations might be due to the differences in the type and natural constituents of the camel milk. Further research is recommended on the identification of the camel milk components that



might have inhibitory activities against the performance of the lactic acid cultures during the camel milk fermentation.

**Acknowledgements:**

We are grateful to Friesland Campina WAMCO Nigeria Plc, for providing the grant for this study; to the Management of the University of Maiduguri, particularly the Department of Food Science and Technology, Faculty of Engineering, for providing the enabling environment to carry out this research; and to the entire Laboratory staff of the National Agency for Food, Drug Administration and Control (NAFDAC) Maiduguri Branch, for assisting in the analysis of the milk samples.

## References

- Abdelgadir, W.S., Ahmed, T.K. and Dirar, H.A. (1998). The traditional fermented milk products of the Sudan. *Intl. J. Food Microbiol.*, 44: 1 - 13.
- Agrawal, R.P., Budania, S., Sharma, P., Gupta, R. And Kochar, D.K. (2007a). Zero prevalence of diabetes in camel milk consuming Raica community of Northwest Rajasthan, India. *Diabetes Res. Clin. Pract.*, 76: 290 - 296.
- Al haj, O.A. and Al Kanhal, H.A. (2010). Compositional, technological and nutritional aspects of dromedary camel milk: a review, *Intl. Dairy J.*, 10: 10 – 16.
- Alwan, A.O and Igwegbe, A.O. (2013). Physico-Chemical Properties of Stirred-Curd Cheddar Cheese Manufactured from Farm-reared Camel and Cow's Milk: A Comparative Study. Accepted for Publication in *Scottish J. Art Sci. Studies*, 2014.
- Alwan, A.O., Igwegbe, A.O and Ahmad, A.A. (2014). Effects of rearing conditions on the proximate composition of Libyan Maghrebi Camel (*Camelus dromedarius*) milk. Accepted for publication in *Intl. J. Engr. Appl. Sci.* 4(8): Feb. 2014.
- AOAC. (2000). *Official Methods of Analysis*. 17<sup>th</sup> Edition. Gaithersburg, Maryland, USA,
- Atherton, H.V. and Newlander, J.A. (1981). *Chemistry and Testing of Dairy Products*. 4<sup>th</sup> Ed., Avi Pub. Co., Inc., Westport, Conn.
- Attia H., Kerouatou, N. and Dhouib, A. (2001). Dromedary milk lactic acid fermentation: microbiological and rheological characteristic. *J. Indust. Microbiol. Biotech.*, 26(5): 263 – 270.
- Benkerroum, N., Mekkaoui, M., Bennani, N. and Hidane, K. (2004). Antimicrobial activity of camel's milk against pathogenic strains of *Escherichia coli* and *Listeria monocytogenes*. *Intl. Dairy Technol.*, 57 (1): 39 – 43.
- Campbell, J.R. and Marshall, R.T. (1975). *The Science of Providing Milk for Man*. McGraw Hill Book Co., London.
- Cook, G.C. and Al-Torki, M.T. (1975). High intestinal lactase concentrations in adult Arabs in Saudi Arabia. *Br. Med. J.*, 3: 135 – 136.
- Dilanyan, S.H. (1959). Utilisation of mares, ewes, camels and yaks milk in the USSR. Report Int. Comm. Dairying in warm countries. Dairy Fed. Brussels.
- El-Agamy, S.I., Ruppner, R., Ismail, A., Champagne, C.R and Assaf. R. (1992). Antibacterial and antiviral activity of camel milk protective proteins. *J. Dairy Res.* 59: 169 -175.
- Elagamy, E.I. (2000). Effect of heat treatment on camel milk proteins with respect to antimicrobial factors: A comparison with cows' and buffalo milk proteins. *Food Chem.*, 68 (2): 227 – 232.
- FAO. (2001). *The Technology of Making Cheese from Camel Milk (Camelus dromedarius)* FAO Animal Production and Health Paper 113. Food and Agriculture Organization of the United Nation, Rome.
- FAOSTAT Database. (2001). Food and Agriculture Organization of the United Nations (FAO), Rome, Italy.
- Farah, Z., Streiff, T. and Bachmann, M.R. (1990). Preparation and consumer acceptability tests of fermented camel milk in Kenya. *J. Dairy Res.*, 57(2): 281-283.

- Farah, Z., Rettenmayer, R. and Atkins, D. (1992). Vitamin content of camel milk. *Intl. J. Vit. Nutr. Res.*, 62: 30 – 33.
- Hashim, I.B., Khalil, A.H., and Habib, H. (2008). Quality and acceptability of a set yoghurt made from camel milk. *J. Dairy Sci.*, 92: 857-862.
- Igwegbe, A.O., Gnan, S.O., Mohammed, M.O. Shareha, A.M. (1992a). A comparative study on the fermentability of camel and cow's milk by lactic acid cultures. *Proceedings of the Conferences*, Pp 153 – 158.
- Igwegbe, A.O., Agukwe, C.H. and Negbenebor, C.A. (2013). A Survey of Heavy Metal (Lead, Cadmium and Copper) Contents of Selected Fruit and Vegetable Crops from Borno State of Nigeria. *Intl. J. Engr. Sci.*, 2(1):1 – 5.
- International Dairy Federation (IDF), (1985). *Antimicrobial Systems in Milk. Part 2 of Proceedings of Symposium on Natural Antimicrobial Systems*, University Bath, England, 10 – 13 September, 1985.
- Johnson, W.U. and Abraham, A. (2005). The effect of short-term heat treatment on vitamin C concentrations in camel milk. *Milchwissenschaft*, 60(3): 266- 267.
- Knoess, K.H. (1977). The camel as a meat and milk animal. *World Animal Rev.*, 22: 39-44.
- Magjeed, N. A. (2005). Corrective effect of camel milk on some cancer biomarkers in blood of rats intoxicated with aflatoxin B1. *J. Saudi Chem. Society*, 9: 253 – 263.
- Mal G., Suchitra, S.D., Jain, V.K. and Sahani, M.S. (2006a). Therapeutic value of camel milk as a nutritional supplement for multiple drug resistant (MDR) tuberculosis patients. *Israel J. Vet. Med.*, 61(3-4): 88-94.
- Mal, G., Suchitra, S.D. and Sahani, M.S. (2006b). Milk production potential and keeping quality of camel milk. *J. Camel Pract. Res.*, 13(2): 175-178.
- Montgomery, D.C. (1976). *Design and Analysis of Experiments*. John Wiley and Sons, Inc., USA.
- Newman, D.M.R. (1975). The Camel: its potential as a provider of proteins in Arid Australia. In: *Proc. III World Conf. Anim. Prod.*, Melbourne., PP 95 – 101.
- Rihab, H.A., El Zubeir, E.M. and Babiker, S.A. (2007). Effect of pasteurization of raw camel milk and storage temperature on the chemical composition of fermented camel milk *Intl. J. Dairy Sci.*, 2(2): 166 - 171.
- Shabo, Y., Yagil, R. (2005). Behavioral improvement of autistic children following drinking camel milk. In: *Treating Persons with Brain Damage. 4th National Conference*. Tel Aviv, Israel.
- Shalash, M. R. (1984). The production and utilization of camel milk. In W. R. Cockrill (Ed.), *The Camelid: An all-purpose animal* (pp. 196 208). Uppsala, Sweden: Scandinavian Institute of African Studies.
- Yagil, R., and Etzion, Z. (1980). Effects of drought condition on the quality of camel milk *J. Dairy Re.*, 47:159-166.
- Yagil, R. (1982). *Camels and Camel Milk*. FAO Animal Production and Health Paper. FAO, Rome, Italy.

# Utilization of Manganese from Waste Batteries for Inclusion in Ceramic Bodies for Special Effects

---

**Alkali Vershima**

*Department of Industrial Design Ahmadu Bello University (Abu), Zaria*

**Abraham D. Morakinyo**

*Modibbo Adama University of Technology, Yola*

**Tukur D. M. Zauko**

*Department of Industrial Design Ahmadu Bello University (Abu), Zaria*

*abrahamolushola@yahoo.com*

## **Abstract**

Shortage of electricity supply in Nigeria makes it mandatory for citizens to source alternative means of power supply. This, they often result to the use of batteries to power their lanterns, touches, radios, toys etc. These batteries soon outlive their usefulness after few days from the time of purchase and are thrown away as waste batteries. These batteries by composition contain manganese dioxide and zinc. The aim of this research is to explore the possibility of using the manganese extracted from waste batteries for inclusion in slip bodies to produce ceramics with unique design effects. A number of these spent batteries were collected from refuse dumps and households and manganese was extracted from them and analyzed. The material was introduced into a semi-white slip in the ratio of 90/10 in favour of clay slip. A number of caste wares were produced. Upon drying, they were fired to 12600C. Results from these experiment showed that manganese blended well with natural clay and created an aesthetic interplay of colour variation. It was found out therefore, that this waste manganese can be reclaimed to become an interesting medium in producing ceramics with unique aesthetic qualities.

**KEY WORDS:** waste, utilization, recycle, manganese, effects, alkaline batteries.

## **Introduction**

Due to poor supply of electricity, a lot of house hold batteries are imported into Nigeria to power alternative sources of power supply such as touches, lanterns, radio sets and toys. Batteries are generally classified into rechargeable and non-rechargeable batteries. The one that is of concern to us in this experiment is the non-rechargeable alkaline batteries. These batteries get exhausted after days or weeks of usage and are thrown away as waste batteries. A large quantity of these dry cell batteries are found on refuse dumps in major parts of our towns. These batteries by composition have manganese dioxide and zinc. Although the inclusion of small amounts of mercury for suppression of formation of internal gases and increased life span is not allowed in many countries, several countries are still producing batteries that have these materials. These batteries after expiration gets ruptured and leakages occur. These leakages constitute environmental hazards of monumental proportion. The poisonous substance when ingested constitutes a serious health problem that impairs the central nervous system, kidneys, lungs and liver.

In 1989 for example, spent household batteries accounted for 88 per cent of mercury entering the municipal solid waste stream. According to environmental fact sheet (2008). With the amount of battery disposal in Nigeria, the risk of ingestion by poor children who go about scouting for leftover food and objects of second hand value on refuse dumps is inconceivable.

The good news however is that, some of the batteries used by the generality of the poor Nigerians and which is a dominant sight on our refuse dumps do not contain those harmful substances under prohibition. They contain Zinc and manganese which do not pose a health hazard or threat to the environment during normal use or after disposal.

The food and drug administration admits that zinc and manganese are recognizable safe nutrients either to soils or dietary supplements. Manganese apart from its use in steel making and being a key constituent in aluminium alloys is used as ore in non-metallic objects such as plants fertilizers, animal feeds and is being exploited by the ceramic industries as colorants for bricks, ceramic glaze and slip bodies for casting as mentioned by (Hamer and Hamer 2004).

One of the ways suggested by environmental fact sheet (2001) on how to reduce battery in waste stream is recycling and re-use of spent battery. Several reclamation companies are being set up now to process these waste batteries and re-use them in one way or the other. The ceramic industry can become one of the reclamation centres if a major component of these waste batteries is found useful to the industry. The aim of this research is to reclaim these waste batteries and extract the manganese contained in them as secondary sources of cheap manganese for inclusion in semi white bodies for special effect and colour variation in ceramic production.

## **Nature and Use of Manganese in Ceramics**

There is generally hardly a production sector that does not generate some form of waste material. All these wastes upon some form of treatment or the other can be reworked to serve some useful purposes. Research efforts and application of findings have been instrumental in converting these wastes to useful purposes.

NEMA (2004) states that battery industries in U.S.A. Europe and Japan are working hard to improve recycling technologies. They have demonstrated the technical possibilities that have resulted in recycling alkaline and zinc carbon batteries in metal smelting furnaces and kilns.

For several decades now, ceramic researchers all over the world have made tremendous efforts at formulating workable clay bodies from earth resources .In the most part, these efforts resulted in combining common clays with other minerals to produce functional and utilitarian forms and other special effects on these wares.

According to Bray (2000) ceramic materials are classified into three to fulfil functional needs. These are forming materials, which assist in the formation of structures. The second functional requirement is the flux, which assist in vitrification process in bodies and glazes. Finally, we have the filler or moderators. Previous researchers in attempt to satisfy these requirements experimented with different materials for inclusion in natural clays and glazes either to achieve different body colouration or alter the general character of the bodies or glazes. Manganese happens to be one of the materials found suitable for inclusion in bodies and glazes as dioxide for different colour effect and monoxide as active flux.

Manganese oxide is said to be an important colorant in rich brown shades. Frank and Janet *ibid* state that manganese is a metal oxide that gives brown and purple effect. It occurs naturally with many iron ores, it sometimes rarely occurs with clay but more often it is introduced. Nelson (1966) however warns that excess amount as colorants can cause blisters to form in body and glazes. It is added in amount up to 10% to yield brown slips and 15% as fluxes to stoneware slips. These causes the slips to vitrify or become slip glazes. Not more than 4% is recommended for inclusion in glazes. Once it is up to 20% it turns metallic in appearances and unattractive. Manganese occurs as ore rhodochrosite  $MnCO_3$  which is pink in colour but can transform into manganese oxide  $MnCO_2$  by the process of calcination. The advantage the extraction of this material from battery waste offers is that, it presents a cheap secondary source of manganese particularly for potters who cannot access the natural mining sites. Secondly, products differentiation which is a consequence of the manipulative effect of manganese in the bodies and glazes can result in more aesthetic appeal, increased demand and higher market value.

### **Methodology**

The population of study chosen for this research is Yola, the state capital of Adamawa, where one is currently on a sabbatical leave. Dump sites were visited and individuals with a collection of used batteries were contacted and above 100 pieces of waste tiger brand of alkaline batteries were collected. These were opened up and manganese weighing 3 kilograms (kg) was extracted. This was split into two equal halves. Part A weighing 1.5 kg was calcined to 900°C according to the recommendation of (Hammer and Hammer, *ibid*), while part B was left in its pure state.

The reason for this varied treatment is not far-fetched. A part of this experiment centres on slip formation for casting in which case, manganese dioxide (in uncalcined state) is recommended for best result; while the manganese oxide (in a calcined state) is recommended for optimal performance in glaze formation. Both of these materials were taken for chemical analysis in the Multi-Purpose Science Laboratory (MUSRL) ABU Zaria. This was done to determine whether the manganese found in waste batteries has the same chemical composition as the ore known for non-toxicity and useful for the purpose earlier on mentioned. Below is the table indicating the result of the chemical analysis.

**Table 1, Showing result of chemical analysis.**

<b>Element</b>	<b>Concentration</b>
Na <sub>2</sub> O	0.320 Wt %
MgO	0.787 Wt %
Al <sub>2</sub> O <sub>3</sub>	6.117 Wt %
SiO <sub>2</sub>	17.427 Wt %
P <sub>2</sub> O <sub>5</sub>	0.610 Wt %
SO <sub>3</sub>	0.499 Wt %
Cl	13.870 Wt %
K <sub>2</sub> O	0.273 Wt %
CaO	0.223 Wt %
TiO <sub>2</sub>	0.244 Wt %
Cr <sub>2</sub> O <sub>3</sub>	0.091 Wt %
Mn <sub>2</sub> O <sub>3</sub>	38.724 Wt %
Fe <sub>2</sub> O <sub>3</sub>	13.312 Wt %
ZnO	7.352 Wt %
SiO	0.153 Wt %

### **Slip Preparation and Production Of Wares**

The method of production a designer or potter chooses to use in ceramic production informs the choice of the clay body to prepare. Since the objects to be produced are cast wares, the choice of slip body is inevitable. The process involved in slip preparation is simple. Ball clay and Kaolin obtained from the local environment were sieved and mixed in a 20 – 80 % ratio in favour of Kaolin. This body formula is adopted from previous studio experiment by Alkali (2012) and is aimed at achieving a near white body that can contrast very sharply the effect of manganese on the body of objects produced.

A part of this body weighing 25 kg in dry form was mixed with manganese dioxide in the ratio of 90 – 10 % in favour of slip clay as suggested by Bray (2000). This was ball milled for 30 minutes so as to achieve a thorough blend of the two materials. Thus the slip was ready for use in casting the forms already taken in plaster moulds.

It is important to know that, the effects we wish to achieve could be deliberate at some points and accidental at other times. But what is important is to achieve interplay of these two bodies in such a way as to create an aesthetic appeal that could be fascinating. The effect of manganese on this semi white body is the central focus of the experiment.

A number of models ranging from standing flower vases and wall hangers for decorative purposes were produced and 1 – 3 piece moulds taking these forms were made with the aid of various design tools. These moulds were made of Plaster of Paris (POP). The ratio of water to POP used is also adopted from previous studio experiment by Alkali (ibid). The clay slips were introduced into the moulds according to the design patterns chosen by the researchers. The conventional method of pouring slips into the mould was grossly violated and this was so that the desired design effect could be achieved. Sometimes some quantity of white slip clay was poured in certain sections of the moulds and allowed to absorb into the mould and poured out then slip containing manganese was introduced at other sections of the mould and when uniform thickness is achieved, it was poured out.

At other times, forms were cast with semi white slips and when set and leather hard, design symbols and patterns would be introduced using the slip made with manganese. In achieving these effects where deliberate, the use of design symbols, motifs and other illustrations that represents subject matters is necessary. These were dried and fired to 900 0C and 1260 0C respectively. Plate I

– VI are a display of the effects accidentally but carefully achieved by the application of coloured slips.



Plate I



Plate II



Plate III



Plate IV





Plate V



Plate VI

### Results and Findings.

In attempting to solve the problem of this research which is the utilization of manganese obtained from waste batteries for inclusion in semi-white bodies for special effects on ceramic wares, the researchers adopted a series of research procedures which included collection of waste batteries and the extraction of manganese from them, analysis of the manganese, inclusion of the manganese in the formulated bodies, the production of wares by casting and finally subjecting the wares to the firing temperature of 1260 0C. Bellow are the results and findings from the experiments.

#### 1 Result of Chemical Analysis of Manganese.

The chemical analysis was conducted to find out whether the elements found in manganese obtained from waste batteries are the same with the one that naturally occur with iron ore. This was determined by INCAX Oxford instrument/DIOOXBJ computer spectrometer 2005 in MUSRL/A B U Zaria. Result from the analysis proved the existence similar elements found in naturally occurred manganese which contains compounds that are compatible with other related ceramic materials. However manganese from waste batteries showed lower values of 27% as compared to about 41% as found literature.

Bellow is the percentage of Manganese in the sample

$$\text{Mn}_2 \quad 55 \times 2 = 110$$

$$\text{O}_2 \quad 16 \times 3 = 48$$

$$\text{Total mass} = 158$$

$$\% \text{ Mn (in Mn}_2\text{O}_3) = \frac{110}{158} \times \frac{100}{1} = 69.62 \%$$

% Mn<sub>2</sub> in Sample

$$\frac{69.62}{100} \times \frac{38.724}{1} = 26.9596$$

$$= 27 \%$$

2 Result from studio experiment showed that manganese from waste batteries can be reclaimed and used as a tempering material in clay bodies for the production of ceramics. Thus creating another avenue through which waste can be rechanneled in order to reduce the negative effect it could have on the environment or promote a better usage of such waste.

3 It was equally found out that waste battery could be a cheap alternative source of manganese as colourants in semi-white bodies for decoration and creation of a variety of design patterns and for the expression of various subject matters or themes.

4 Results showed that there is a positive effect of manganese inclusion in the semi-white clay bodies. The clay body containing manganese contrasted very sharply with the ordinary clay slip thereby creating an interesting interplay of colours and colour variation on the ware. It equally acquired a much better shine or brilliance on the surface areas where manganese incorporated bodies appeared.

5 Findings from results showed that, bodies mixed with manganese fused at a much lower temperature than bodies made with common clay. It showed that bodies predominantly composed of manganese can melt faster thereby reducing cost of energy and human labour.

6 It was found out that bodies incorporated with manganese promoted a better fluidity of the glaze on the ware thereby correcting the defect of crazing as compared with bodies without manganese where the same glaze was applied.

7. It was discovered that the recycling or reclaiming of used alkaline batteries is actually a feedstock for another production process were a new product can/has emerge.

#### **Drawback from Research Experiment.**

Low water absorption of the plaster moulds appears to be a major drawback in working with bodies containing manganese. Portions of the ware where manganese dominated clay slips were used absorbed into the plaster very slowly, consequently leading to very a slow casting process.

#### **Summary and Conclusion**

It has become obvious going by the series of experiment undertaken, that waste batteries can be collected from disposal centres and manganese contained in them can be extracted and utilized as an alternative source of manganese. This manganese blended very well with natural clay and became an interesting medium in producing ceramics with high aesthetic qualities.

The aesthetic value found on such ceramics can create the differentiating factor that could make all the difference in determining the market value, thus promoting higher demand and sales.

## References

- Alkali, V. (2014). "Exploration of the Potentials of Granite Sawing Waste in the Development of Ceramic Bodies". An unpublished PhD Dessertation, Department of Industrial Design Ahmadu Bello University,Zaria. pp42
- Charles, B. (2000). "Ceramic and Glass: a Basic Technology". Society of Glass Technology, Don Valley House Savile Street East Sheffied S47UQ. pp204
- Hamer and Hamer (2004). "The Potter's Dictionary of Materials and Techniques". pp226.
- Malavika, C. R. (2004). Environmental Effect Associated with Battery Disposal.  
<http://www.frost.com/sublib/display-market-insight-do?id=>
- Nelson, G. C. (2006). "Ceramics the Potters Hand Book". Holt, Rinehart and Winston, New York.Chicago.San Francis. Toronto. London.
- NEMA (2004). "Household Batteries and the Environment" North 17 Street Suit 1847 Rosslyn Virginia.
- Universal Waste -Used Batteries.Environmental Fact Sheet (2004) Adeq Hazardous Waste Division 5301 Northshore Drive. North Little Rock.USA.
- Universal Waste-Used Batteries. Environmental Fact (Sheet 2008) Adeq Hazardous Waste Division 5301 Northshore Drive. North Little Rock.USA.
- Website: [www.nema.org](http://www.nema.org).