

M POVERTY REDUCTION STRATEGY USING RURAL STONE  
MINING

(A CASE STUDY OF KYASIONI QUARRY IN YATTA DISTRICT)

PRESENTED BY

KISING'U GEOFFREY MUINDI

X50/P/7671/2006

A RESEARCH PAPER submitted to the University of Nairobi School of Economics in partial fulfillment of the Degree of Master of Arts, Economic and Policy Management.



SEPTEMBER 2011

**DECLARATION**

This research is my original work has never been presented in any other University.

Geoffrey Muindi Kising'u  .....Date

(0(5 6 (t

This Research paper has been submitted for examination with our approval  
University Supervisors

Dr. L. M. Awiti ... ( ... > ..... NCq1- .....Date

j i o j i ^ 1 1

PROF. S. W. Masai \_\_\_\_\_Date.

## **DEDICATION**

This research work is dedicated to my Wife Juliana Syokau and my son Abednego Kising'u for moral support and encouragement they gave me throughout the time of my studies.

## **ACKNOWLEDGEMENTS**

I wish to acknowledge the contribution of my mother Theresa Mbulwa Kising'u who taught me the art of Economics even at a tender age. I also wish to thank my sister Margaret Kanini Kising'u and her family for being there for me without forgetting my brother Dr. Sila Kising'u and his family for their enormous contribution towards the success of this work. I cannot fail to acknowledge my late father George Kising'u Sila who taught me the value of education and hard work may his soul rest in peace.

To my supervisors Dr. L.M Awiti and PROF. W. Masai, I sincerely thank you for the advice and guidance in achieving this long-term dream. To my classmates and school mates in University of Nairobi School of Economics, thank you for your moral support. Thank you all mentioned and unmentioned for the role you played in making this research a success. Your efforts are recognized. Thank you all.

## TABLE OF CONTENTS

Declaration.....	11
Dedication.....	111
Acknowledgements.....	1V
Table of Contents.....	v
List of Tables.....	vii
List of Graphs and Charts.....	ym
List of Acronymns and Abbreviations.....	1X
Abstract.....	
<b>CHAPTER ONE: INTRODUCTION.....</b>	<b>1</b>
1 1 Background.....	1
1.2 Definition of Poverty.....	4
1.3 Poverty in Kenya	
1.3.1 Overview of rural poverty.....	5
1.3.2 Poverty situation in Yatta District.....	7
1.4 Statement of problem.....	8
1.5 Objectives of the study	
1.6 Significance of the study.....	10
1.7 Justification of the Study.....	11
1.8 Scope of the Study.....	12
<b>CHAPTER TWO: LITERATURE REVIEW.....</b>	<b>13</b>
2.1 Theoretical Literature.....	13
2.1.1 Measurement Issues.....	13
2.1.2 The Determinants of Poverty Lines.....	16
2.1.3 Cost of Basic Needs (CBN) Methods- based Poverty lines.....	16
2.1.4 Food Energy Intake Model (FEI) Method-based poverty lines.....	17
2.2 Empirical Literature.....	19
2.3 Overview of the Literature.....	24

<b>CHAPTER THREE: METHODOLOGY</b> .....*	26
3.1 Theoretical Framework.....	26
3.2 Model Specification.....	26
3.2.1 Constructing FEI-based poverty lines.....	26
3.2.2 Poverty Measures.....	27
3.2.2 Data Type and Sources.....	30
<b>CHAPTER FOUR: DATA ANALYSIS</b> .....	32
4.1 Data analysis and Empirical Results.....	32
4.1.1 Summary statistics of the variables used in the study.....	32
4.1.2. Empirical Analysis.....	39
4.1.3. Estimation Procedure.....	47
<b>CHAPTER FIVE: CONCLUSION AND POLICY RECOMMENDATIONS</b> .....	51
5.1 Conclusion.....	51
5.2 Policy Recommendations.....	52
REFERENCES.....	54
Appendix I: Questionnaire for the stone workers.....	58
(Stone cutters and loaders).....	58

## **LIST OF TABLES**

Table 1. Summary of monthly Spending

Table 2. The Type of Housing workers own or live in.

Table 3. Education Level

Table 4. Other income Sources

Table 5. Summary Statistics

Table 6. Number of Dependants

Table 7. Income Changes due to Stone quarrying

## **LIST OF GRAPHS AND CHARTS**

Graph 1: Category of Workers

Graph 2: Level of education

Graph 3: Why you do stone quarrying

Graph 4: Monthly spending

Graph 5: Type of Housing you live in

Graph 6. Age of the workers

Graph 7. Statistical Analysis of Monthly spending



## LIST OF ACRONYMS AND ABBREVIATIONS

USDA	United States Department of Agriculture
FGT	Foster, Greer and Thorbecke
CBN	Cost of Basic Needs
FEI	Food Energy Intake
WMS	Welfare Monitoring Survey
KIHBS	Kenya Integrated Household Budget Survey
KNBS	Kenya National Bureau of Statistics

## **ABSTRACT**

This paper assesses the relationship between Small-scale mining and poverty laying emphasis on the fact that small-scale mining is poverty driven. Using a classical example of Kyasioni Quarry in Yatta District the research is intended at proving that small-scale mining can be used as a tool for poverty reduction using Food and Energy Intake approach. With key parameters like income spend per day on basic needs and non-food items, education, the kind of houses the miners live in and the number of dependants they have it will be easy to determine how poor this population is. Armed with this information, the research will prove that the people involved directly in this mining activity are poor hence the need to provide a policy recommendation to use this rural small-scale stone mines as an engine for economic growth and poverty reduction.

The study found that most stone workers at Kyasioni quarry are poor earning less than two dollars per day. Also they spend over 80% Of their earnings on food only. In addition to the low earnings most of the workers live in temporary and semi permanent houses, are uneducated and rely on small scale farming for sustenance.

Using this mining activity at Kyasioni the stone workers and the residents of this area can benefit by ensuring better wages for the stone workers, better education for their children, decent housing and high trickle down effect on the cash inflows into this quarry. Using the stone quarrying at Kyasioni the government can empower the local residents financially and economically making them less vulnerable to economic shocks. Key to this study is to help the local residents be economically independent, be able to access better health services, good education for their children and have better housing as a positive development due to the existence of the highly valued building stones at Kyasioni quarry. This would act as one of the strategies by the government to reduce poverty in rural Kenya.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

Though the world is technologically advancing and a lot of wealth being amassed deep poverty is still a challenge worldwide. According to Granzow(2000) in the year 2000 over one billion people lived on less than a dollar a day, three billion on less than two dollars and over one and a half billion lacked access to safe water. Over 125 million children worldwide have not attended primary school and millions more went to bed without food every night.

Better economic and sound macroeconomic policies help in reduction of poverty since economic growth alone is insufficient measure of standards of living.

There is need for effective poverty reduction strategies like pro-poor and sound economic policies, good governance and better action to deal with the high levels of material inequality in the countries, low levels of education and poor land tenure systems. These policies should help mitigate the impact of personal and national calamities. There should be actions taken to fight gender problems, ethnic discrimination and ensure equality in sharing national resources and government commitment to provision of services.'

In many African countries though there has been steady economic growth although there are still large pockets of poverty. This has made the achievement of the Millennium Development Goals a big challenge to these countries by 2015 (African Development Bank 2007). With exceptions of a country like Mauritius; other sub-Saharan countries were unlikely to meet the goals due to the prevailing economic conditions. Over 50% of many of the country populations live in extreme poverty conditions.

Few African countries have done enough to fight hunger and agriculture' has been failing year in year out. Half of Africa's population of about 800 million lives in

absolute poverty. The number of poor people in Africa is increasing. The economic progress in Africa has been slowed down by rapid population increase, declining agricultural productivity and social, ethnic and political conflicts.

Poverty indicators for Africa show that the majority of the poor live in rural areas, with subsistence agriculture, fishing, hunting and gathering as their main source of livelihood. In both urban and rural areas, women and children comprise, relative to men a disproportionately large number of people living in absolute poverty. A researcher carried out by the International Institute of Environment and Development on small scale mining in countries in Central Asia republic, Democratic republic of Congo, Republic of Congo, Ethiopia, Guinea, Kenya, Namibia, Madagascar, Nigeria, Niger, Sierra Leone and Uganda have that proper use of the incomes from small scale mining activities can lead to significant reduction in levels of poverty. This has shown that small scale mining have the ability to enhance economic growth and poverty reduction once used properly.

Other countries where such like research has been carried out include Laos, Malaysia, Myanmar, Thailand, Vietnam, Columbia, Mexico, Nicaragua, Dominican Republic and Venezuela.

According to International Labour Organizations (2002) report, over 13 million people are engaged directly in small scale mining throughout the world. This is mainly in developing countries. Another 80- 100 million people are affected by the activities of these small scale miners.

The small scale mining is no doubt an important employment-generating sector. It provides an important source of livelihood for women, children and men in countries and regions where people are very poor.

The small scale mining sector produces for the local market, villages and local consumption. The small-scale mining can be used as a tool for sustainable development. To ensure sustainability of small scale mining project, the UN department of Economics and Social Affairs has developed an interest in enhancing

small scale mining projects in the rural poor of Mali, Ethiopia, Ghana and Guinea under a pilot implementation project.

The main recommendations of this approach according to Labonne and Cullman (1999) are:

- (i) Mainstreaming poverty reduction in national policy making in all sectors including minerals.
- (ii) Promoting small scale mining as a catalyst and anchor for other productive activities to stimulate the development of complementary and alternative productive ventures necessary for sustainable poverty reduction.
- (iii) Placing people first through pro-poor strategies and participatory strategies aimed at strengthening the organizational capability of grassroots communities, thereby favoring a bottom-up approach in poverty reduction.
- (iv) Reversing the focus from hands-on state intervention which has rarely been successful to creation of private enterprises, particularly micro enterprises or co-operatives.

Women participation enables better control of family revenues and spending. Women take part in this sector as an alternative to the subsistence agriculture which is not performing well. This boosts their family income. Empowering women in the communities leads to substantial reduction in poverty.

With the collapse of agriculture, many people who relied on agricultural seek new alternative and additional paid employment for a better life and for survival.

Due to the great importance of the workforce of small scale mining in the rural context the potential for a beneficial contribution of small scale mining to sustainable development is very high. This will fasten the process as poverty reduction.

## **1.2 Definition of Poverty.**

Poverty is the state of material, social, economic and political deprivation. Poverty is a multidimensional and complex phenomenon in nature. There is no single explanation of poverty which captures all its aspects. Poverty is perceived differently by different people. Poverty is the state of material, social, economic and political deprivation. Poverty is a multidimensional and complex phenomenon in nature. There is no single explanation of poverty which captures all its aspects. Poverty is perceived differently by different people.

According to World Bank (2000) report, poverty is the lack of power to command resources and is multidimensional phenomenon. The poor take different faces due to multiple in terms of economic, political and social processes. Poverty is also accompanied by lack of income, lack of productive land, lack of credit facilities and inaccessibility to key social services like health and education. Ill treatment when seeking services and powerlessness when trying to influence decision making is a key indicator of poverty.

Poverty can also be defined as malnourishment, homelessness, inability to access medical care, lack of an informed mind, lack of basic general knowledge and basic literacy skills, lack of savings and inaccessibility to credit, living from hand to mouth by the day, merely existing, scraping through life and groping for a meaningful co-existence with others including nature.

Using quantitative approach poverty is defined as lack of basic and non-food items. In addition to poverty been looked at as a monetary issue it is also seen as the inability to afford health, education and literacy with social deficiencies, insecurity low self-esteem and voicelessness and powerlessness.

Using monetary terms there are two ways of measuring poverty: absolute poverty and relative poverty. Absolute poverty is the inability of persons to satisfy basic needs over a period of one month. Due to low monthly income levels many of the

affected persons have a lower human dignity leading to immoral behaviors, lack shelter and starvation.

Relative poverty is defined in relation to overall income distribution consumption in a country. Small -scale mining activities are widely spread in developing countries in Africa, Asia, Oceania, Central and South America.

### **1.3 Poverty in Kenya**

#### **1.3.1 Overview of rural poverty**

Poverty has been persistent in Kenya despite government's effort to combat it through national development programmes. The formulation of appropriate programmes to effectively combat poverty requires the identification of the poor and a measure of the extent of their poverty. As mentioned earlier, to analyze poverty one needs to specify a poverty line and construct an index measure of the intensity of poverty. Individuals falling below the poverty line are considered to be poor. The poor are, however, not a homogeneous group. Therefore, one blanket cover programme is not adequate to solve the problem of different poverty levels among the poor. This section reviews the extent of poverty in Kenya and the characteristics of people it afflicts.

According to S. Nyandemo and Kunwar D. Singh Economics of Development and planning (2003) the high level of poverty is a major problem to majority of developing countries Kenya included. This people in these developing countries live in rural areas and informal settlements where infant mortality is very high, per capita low, low school enrolment rates, poor health and sanitation condition.

This sorry state of the people has been as a result of economic and political mismanagement in the face of adverse external conditions.

According to the USDA Economic Research Service (2004) an individual with means less than 2dollars a day that is deemed sufficient to purchase basic needs of food, shelter, clothing; and other essential goods and services is classified as poor. In Kenya over 56% of the population lives in rural areas and under one dollar per day. This clearly shows that people cannot afford the daily basic essentials for their comfortable living.

In the past 30 years poverty has been on the rise in Kenya. This is according to IF AD report of (2007), poverty seems to be a paradox in a country that has the best developed economy in Eastern Africa, with a relatively advanced agricultural and industrial sectors and substantial foreign exchange earning from agricultural exports and tourism.

Kenya is a low-income country with per capita income averaging about US Dollars 360 Per Annum.

Kenya is ranked 148<sup>th</sup> out of 177 countries in the United Nations development programs human development index that measures a country's development in terms of life expectancy, educational attainment and standards of living.

More than half of the country's over 28 million people are poor, and 10 million of the poor live in extreme poverty (Census 1999).

Increase in Kenya's population over the past 30 years has lead to increasing pressure on natural resources, widening income gap, and rising poverty levels that erodes gains in education, health, food security, employment and income.

The causes of rural poverty include low agricultural productivity as a result of land degradation and insecure land tenure systems, unemployment and low wages, difficulty in accessing finances for self-employment, poor governance, and poor infrastructure, high costs of health and education and HIV/ AIDS. The Kenya's rural poor includes small scale farmers, herders, farm laborers, unskilled and semi-skilled workers, households headed by women, people with disabilities and AIDS orphans. To substantiate their meager income some of the rural poor people take part in rural mining projects to substitute agriculture and other unreliable income sources.



### **1.3.2 Poverty situation in Yatta District.**

Yatta District was carved out of the larger Machakos District. The population is estimated at 166,731 inhabitants according to the Kenya National Population Census (2009). The main commercial town is Matuu town located East of Nairobi approximately one hundred and twenty kilometers (120 Kms) along the Thika Garissa highway. The Kyasioni quarry is located six Kilometers (6 Kms) South of Matuu town along the Matuu Katangi road. Matuu town is one of the key commercial towns and a consumer of the building stones from the quarry. The quarry employs about 1000 people directly as stonecutters and loaders. This information can be used as basis for the study.

Yatta District was carved out of the larger Machakos District. In Machakos District according to KNBS well being in Kenya a Socio-Economic Profile (2008), it clearly depicted that the proportions of the poor were higher when the households had large families (seven or more dependants). The head of the household makes all the major decisions within the household. The percentage of the poor in Machakos District stood 70.5 % for the married monogamous families, 6.7% for polygamous families, 21.7% for widows and widowers and 1.1% for divorced and separated. In the same report 84.2% of the respondents had primary education and classified as poor. They attributed their lack of education to lack of money and lack of interest. They also argued that secondary education is too expensive due to high cost of uniforms, supplies, fees, transport- and overall household welfare. This is despite that education enhances ones economic and social well being.

In Yatta District according to the KNBS Constituency Basic Report on Fourth Poverty Participatory Assessment (2007), the people believe they are poor due to poor access to infrastructure that is roads, unfavorable economic conditions including unemployment and low wages, unethical social and personal behavior like laziness and alcoholism, lack of education and failed farming (crop failure).

To be able lift themselves from poverty they turned to rural small scale stone mining as a form of economic activity to sustain themselves and their families regardless of the low wages they are paid by the Quarry owners.

The average poverty line for in Yatta District is Kshs. 1,562 per adult equivalent per month. This is according to KNBS Well Being in Kenya a Socio-Economic Profile (June 2008). The percentage poverty incidence in Yatta stands at 60.4%. Kyasioni quarry in Yatta District has high poverty incidence just like the rest of the district. This percentage is according to the KNBS Constituency Report on Wellbeing in Kenya using KIHBS 2005/2006. When the households were affected by shocks like drought, famine, sudden illness, unexpected deaths, inflation, they either worked more and harder or sought help from family members and friends. Others turned to rural stone mining as for residents of Kyasioni stone mining region. In addition to their crop farming and small scale animal keeping (cattle, goats and poultry), rural stone mining has helped the residents mitigate the negative effects of the shocks and uncertainties.

This is a case study of using Rural Stone mining activity in Kyasioni stone mining region to empower the rural population and help in enhancing their economic capability and enhance poverty reduction in the Kyasioni stone mining region.

#### **1.4 Statement of problem.**

Despite the concerted efforts of the international community together with the Government of Kenya towards poverty reduction in the country, poverty remains as one of the greatest challenges to be addressed. Since independence, the Government has developed and implemented policies and programs with a view to reducing poverty of the Kenyan people alongside addressing other socio-economic issues. However, according to available literature little progress towards this end was only reported in 2005/2006 per the Kenya Integrated Household Budget Survey. The Survey shows that the rural food poor, absolute rural poor and hardcore rural poor

incidences declined from 50.7% to 47.2%, 52.9% to 49.1% and from 34.8% to 21.9% respectively from the WMS III, 1997 findings based on the per adult equivalent.

At the national level the food, absolute and hardcore incidences, declined from 48.7% to 45.8%, 52.3% to 45.9% and from 29.6% to 19.1% respectively for the same period. However, given the current global financial, crises and food shortage, the post election disturbances of the year 2007 and 2008 that befell the country coupled with the high inflation, drought and-famine its logical to conclude that the gains on poverty decline reported in 2005/2006 have been eroded and poverty has now worsened. The post election disturbances negatively affected agriculture through delay in land preparation, displacement of farm workers rising cost of farm inputs and brought in general insecurity and reduction of the confidence in farmers of security of their farm investments.

In view of the above economic growth was expected to slow down to about 4.4 percent 6 percent in 2008 from the estimated 7 percent in 2007 (Republic of Kenya, 2008).

When economic growth is slow or negative, poverty in general increases (Kakwani et al, 2004). However, growth is necessary but not sufficient condition of poverty reduction, unless individuals in a society share the benefits equitably. In this regard, Kimalu et al. (2002), argued that as economic growth increases, poverty decreases, and as inequality in income increases, the incidence of poverty increases.

Focusing on the study area, Yatta District which was curved out of the larger Machakos District has a population of about 166,731 inhabitants. Past national surveys and studies indicate that Yatta District has been one of the districts that have high poverty (incidences, depth and severity) and contributing highly to the national poverty. However, the past poverty analysis have focused on the development of rural and urban poverty measures and lines, but not at the disaggregated district level. For instance, the overall rural poverty line, severity measure seems to have remained the same that is P = 11 in both the WMS III, 1997

and the KIHBS of 2005/2006. This can be interpreted to mean that severity has been the same all through, assuming the poverty lines in the different years are comparable. This may not give a clear picture to come up with the right intervention measures to help in reducing the rural poverty in the district.

The use of district disaggregated data therefore, unlike the national aggregated data will provide sharper insights and facilitate relevant policy formulation and intervention measures to address poverty in Yatta district and more specifically Kyasioni stone mining region. This' study aims at determining whether the local population of the Kyasioni stone mining region and is poor and help in recommending the use of the rural stone mining economic activity as a source of income and help in fighting poverty hence poverty reduction.

#### **1.5 Objectives of the study.**

The general objective of the study is to recommend the use of rural stone mining activity in Kyasioni as a tool for poverty reduction in the stone mining population of Kyasioni region Yatta District.

The study aims at achieving the following key objectives:-

- (i) Measure the level of poverty in the population in the Kyasioni Stone mining region in Yatta District
- (ii) Analyze sources and levels of income of the stone cutters and loaders in Kyasioni stone mining region in Yatta District.

#### **1.6 Significance of the study.**

Rural mining is an integral part in the economic development, economic empower and poverty reduction in the Kenya's rural population.

Proper policies when put in place will help the rural population have better wages, better investment opportunities, well managed resources leading to better empowered population.

The study will use the wage pattern, housing pattern, education and other income patterns and accessibility to healthcare as key guide in the research.

This will help in formulating policies for better use of rural mining project not only in Kyasioni, Yatta district but in the rest of the country with a better mining policy the government can use Kyasioni Stone mining and other new ones as engine for economic growth and poverty reduction for the country's rural population.

### **1.7 Justification of the Study.**

Poverty remains a pervasive national problem presenting formidable challenges, which call for urgent action. Social equity and equitable access to public services have been part of nation's development agent since independence. There have been wide disparities between the rich and the poor due and inequitable distribution of resources and lack of access to public services noticed in different regions, among some individuals and along gender lines. There are wide income disparities within rural areas and rural - urban inequalities which need to be dealt with.

Poverty is a key development challenge which keeps confronting the government and needs to be addressed. To address this government needs to utilize the rural stone mining projects to create income redistribution for the rural population. This would help bridge the gap between the poor and the non-poor in political, economic and human rights issues as well as utilization of their rural resources without being exploited by unscrupulous middlemen.

This study attempts to show how rural mining as be Used in other parts of Africa mainly Southern Africa, West Africa and East Africa as a tool to fight poverty in rural areas and create economic empowerment to the people involved in this activities.

The study will provide useful information on the viability of Kyasioni rural stone mining activity in poverty reduction. This will provide useful information to those government ministries and non-governmental organizations involved in poverty

reduction programmes in the country (*Mainstreaming Artisanal and Small scale mining in poverty reduction 2001 report by Economic Commission of Africa*).

There is need for broad literature on different strategies for reducing and eventually eradicating poverty using rural mining projects. This would be a valuable resource for reference in decision making and policy formulation.

### **1.8 Scope of the Study.**

Literature depicts poverty as a rural phenomenon although there are large pockets of poverty in urban areas (Republic of Kenya, 2000a, 2004 and 2007a; Mwabu et al, 1999). Most rural residents in Yatta Districts engage in Agriculture which has largely been unsuccessful.

The aim of the study is to assess the poverty levels in Yatta District specifically Kyasioni stone mining region.

This will help in relating poverty with low wages. Using this information it will be easy to prove that when wages are low poverty levels are high and when wages increase the poverty levels decline.

According to the Economic Commission of Africa's *Mainstreaming Artisanal and small scale mining in poverty reduction (2001)* small scale mining has been used in countries like Mali, Tanzania, Congo, Mozambique, Ethiopia and many other African countries. These activities have enhanced economic growth and helped in poverty reduction.

Using the same model the Kyasioni stone mining activity can be a useful source of income for the rural populations' economic empowerment and poverty reduction.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Theoretical Literature.

##### 2.1.1 Measurement Issues.

Sen (1976) recognized the earlier works done by Rowntree, Weibrd, Tonsend and Atkinson in the area of measurement of poverty. He pointed out the two distinct problems that are faced in measurement of poverty namely:- identification of poor among the total, population; and construction of index of poverty using the available information on the poor. He observed that little work had been done on the second issue. Hence, towards this end, Sen come up with two axioms of poverty measurement:-

- (i) Monotonicity Axiom: Given other things, a reduction in income of a person below the poverty line must increase the poverty measure.
- (ii) Transfer Axiom: Given other things, a pure transfer of income from a person below the poverty line to anyone who is richer must increase the poverty measure.

Based on the two axioms, he found that the headcount index widely used to measure the percentage of the people below the poverty line violated both the Monotonicity and the transfer axioms. Further, he found out that the poverty gap index, which is the aggregated shortfall of the income of all the poor taken together from the poverty line, only satisfied the Monotonicity axiom but not the transfer axiom. Hence, the motivation of this research is to measure poverty using the existing axioms. The Sen' Monotonicity axiom ensures that measure is responsive to the severity of poverty of each individual.

Kakwani (1980) provided a generalization of the Sen's measure for its failure to satisfy some transfer - sensitivity axioms. He proposed the following transfer axioms in addition to the Sen's Monotonicity and transfer axioms:-

- (i) Monotonicity-Sensitivity: If  $(AP)_i$  represents the increase in poverty measure due to a small reduction in the income of the  $i$ th poor, then  $(AP)_i > (AP)_j$  for  $j > i$
- (ii) Transfer-Sensitivity I: For any positive integer  $p$  and any pair of poor individuals  $I$  and  $j$ , if  $j > I$ , then  $(AP)_{i, i+p} > (AP)_{j, j+p}$  is the increase in poverty measure due to a transfer of income from the  $i$ th poor to the  $(i+p)$ th poor.
- (iii) Transfer- Sensitivity II: If a transfer of income takes place from the  $i$ th poor with income  $x_i$  to a poor with income  $(x_i + p)$ , then for a given  $h > 0$ , the magnitude of increase in poverty measure decreases as  $I$  increase.

The failure of the Sen's (1976) measure (including its variants that rely on rank-order weighting) to satisfy the basic condition that an increase in sub-group poverty must increase total poverty, led to the development of the FGT decomposable measure of poverty in 1984 by Foster, Greer and Thorbecke. This was despite the fact that, the transfer axiom captures the concept of relative deprivation, which requires that, a poverty measure be most sensitive to the well being of the poorest of the poor. The FGT index has been widely used by many researchers and satisfies Sen's axioms and is associated with the inequality measure, the Squared coefficient of variation,

$$P = 2 - \frac{1}{n} \sum_{i=1}^n \left( \frac{y_i}{z} \right)^2$$

Foster, Greer and Thorbecke (1984) defined poverty measure as below: •

$$P(y; z) = \frac{1}{n} \sum_{i=1}^n \left( \frac{y_i}{z} \right)^2$$

Where

$Z =$  predetermined poverty line,  $y = y_1, y_2, \dots, y_n$  is a vector of household incomes in increasing order,

$g_i = z - y_i$ , is the income shortfall of the  $i$ th household,



$q=q(y; z)$  is the number of poor households (with income not greater than  $z$ ), and  $n=n(y)$  is the total number of households.

The FGT (1984) measure contrasts the Sen's measure, which adopts a "rank order" weighting scheme, because  $P$  takes the weights to be the shortfalls themselves. Deprivation depends on the distance between a poor household's actual income and the poverty line, not the number of households that lie between a given household and the poverty line.

Kakwani proposed a sensitivity transfer axiom which states that: If a transfer  $t>0$  of income takes place from a poor household with income  $y_i$  to a poor household with income  $y_j+d$  ( $d>0$ ), then the magnitude of the increase in poverty must be smaller for larger  $y_i$ . The FGT (1984) generalized class of measures satisfies this transfer sensitivity axiom. For each  $a > 0$ , and  $P_a$  is defined by

$$P_a(y; z) = \frac{1}{n} \sum_{i=1}^q \left( \frac{g_i}{z} \right)^\alpha.$$

With the FGT (1984) class of poverty measures,  $P_0$  is the headcount ratio,  $H = q/n$  measures poverty incidence or the ratio of the number of the poor to the total population, while  $P_1$  is the income-gap measure that reflects the average distances of the poor below the poverty line.  $P_2$  measures incidence, depth and the distribution of poverty among the poor and is therefore a more superior index. According to FGT (1984), this family of measures satisfy the Monotonicity axiom for the  $a > 0$ , the transfer axiom for  $a > 1$  and Kakwani's transfer sensitivity axiom for  $a > 2$ .

Sen's measure and its variants are not well suited for poverty analysis by subgroup, for when income in a given subgroup changes (the rest remaining fixed), this axiom requires that subgroup and total poverty to move in the same direction but Sen's measure violate this consistency requirement in certain cases. On one hand the FGT (1984) class of measures satisfies this shown by

$$1 \leq \frac{P_a(y; z)}{P_a(y_1, \dots, y_m; z)}$$

Where by for any income vector  $y$  is broken down into subgroup income vectors  $y_1, \dots, y_m$

And an increased poverty in a subgroup will increase total poverty at a rate given by the population share  $n/n$ ; the larger the population share the greater the impact. The decomposition of the equation allows a quantitative and qualitative assessment of the effect of the changes in-subgroup poverty on total poverty.

### **2.1.2 The Determinants of Poverty Lines.**

As highlighted above measures use a predetermined poverty line, and different authors have proposed ways of computing poverty lines. The common methods cited in the poverty literature are cost of basic needs (CBN) and food energy intake (FEI) methods. Both methods are anchored on estimating the cost of attaining a predetermined level of food energy or calorie intake.

### **2.1.3 Cost of Basic Needs (CBN) Methods- based Poverty lines.**

The CBN methods aims to compute the cost of basic needs whose common indicators include food, clothing, basic education, health status and transport among others. The method was used first by Rowntree (1901) in his seminal study of poverty in the English town of York (World Bank, 2000). According to the study, Rowntree conducted a survey covering nearly every working class family in York to collect information on earnings and expenditures. He defined poverty as a level of total earnings insufficient to obtain the minimum necessities for maintenance of "mere physical efficiency" including food, rent and other items.

He calculated that for a family of five, that is a father, mother and three children the minimum weekly expenditure to maintain physical efficiency was twenty one shillings (21) and eight pence (8). He proposed other amounts for families of different size and composition. Comparing these poverty lines with family earnings, he arrived at his poverty estimate. Rowntree calculated that 10 percent of the population of the English city of York in 1899 was living in poverty (World Bank, 2000). Rowntree's method has been followed in a number of studies for both industrialized and developing countries, such as Thomas's (1980) work on the regional poverty profile in Peru (Ravallion and Bidani, 1993). According to Ravallion and Bidani (1993), the CBN method can be interpreted in two quite distinct ways. First, it can be interpreted as the cost of utility but only under special assumptions about



preferences. For example if one uses the cost of a given basic-needs bundle then one must assume that utility-compensated substitution effects are zero.

Secondly, it can be interpreted as a socially determined normative minimum for avoiding poverty, and the cost of basic needs is then closely analogous to the idea of a statutory minimum wage rate. The use of CBN method has a number of problems. First, according to Ravallion and Sen (1996), the poverty lines it generates can be interpreted as Laspeyres cost-of-living numbers. So that utility-compensated substitution effects in consumption are ignored. Secondly, there is the problem of setting non-food "basic-needs" and in valuing their cost at local prices. Hence, due to this problem the CBN method is inappropriate when one tries to achieve consistency. But one strength of the CBN method over others is the method controls for differences in purchasing power over basic consumption needs.

#### **2.1.4 Food Energy Intake Model (FEI) Method-based poverty lines.**

FEI method is the main alternative to the CBN method. The method proceeds by finding the consumption expenditure or income level at a person's typical food energy that is just sufficient to meet pre-determined food energy requirement. The method has been used to construct poverty lines in many countries. For example Greer and Thorbecke (1986) have used this method to construct poverty lines for Kenya. Other proponents noted are Osmani (1982) and Paul (1989) among others (Ravallion and Bidani, 1993).

Though the FEI method has been widely used by many researchers, it has got its own problems. Ravallion and Bidani (1993) have showed that the method does suffer the inconsistency problem. The method can yield differences in poverty lines far in excess of the cost of living differences of the poor. Ravallion and Bidani (1993) compared the FEI method with a price adjusted poverty profile for Indonesia and found that the differences in poverty lines between the urban and rural sectors implied by the FEI method were large enough to cause a reversal in all poverty measures between urban and rural areas and numerous reversals in all poverty ranking of provinces.

After adjusting for differences in the cost of basic consumption needs, they found a greater incidence, depth and severity in poverty rural areas than in urban areas. The authors argue that when the aim of setting up poverty profiles is to inform policy, whether or not a given standard of living constitutes poverty should not depend on the subgroup to which a person belongs. These inconsistencies arise because FEI is determined by many factors besides real incomes, such as relative prices, tastes and activity levels that can influence the poverty lines obtained by FEI method in ways that have nothing to do with differences in purchasing power over basic consumption needs (Ravallion and Bidani, 1993).

Consistency requires that the poverty lines used should imply the same command over basic needs within the domain of poverty profile. Ravallion and Bidani (1993) also argue that food is relatively cheap, people will consume more and poverty lines will be higher where the prices of food are higher. They demonstrated that higher prices of food together with lower calorie requirement of most urban jobs imply that calorie intake is lower than that of rural areas. Thus the FEI method assumes that the relation between food energy intake and total consumption expenditure is the same across the domain of any poverty comparison.

Another weakness of the FEI method is that it may build in differences between poverty lines that are not related to the agreed upon definition of the standard of living especially if one is comparing urban and rural areas. Poverty estimates are very sensitive to some assumptions, such as in deciding how to treat measurement errors and how to allow for household size and consumption data collected at the household level have a basic shortcoming in that they can't reveal inequality within the household, therefore understating overall inequality and poverty.

Ravallion and Bidani (1991) showed that poverty lines need to be adjusted for different areas for example for rural and urban areas if prices or access to goods and services differs. The FEI method is weak in this aspect. A poverty profile constructed

on the basis of this method could possibly deviate from one that is consistent in terms of the household's command over basic needs. With data from Indonesia, Ravallion and Bidani (1993) have shown that the FEI method can yield differentials in poverty lines (such as between rural and urban areas) in excess of the cost of living differential facing the poor, thus misleading policy choices at reducing absolute poverty.

In comparing the FEI and CBN methods with Indonesian data, Ravallion and Bidani (1993) found the CBN measure to give higher poverty incidence, depth and severity in rural areas, while the FEI method finds all measures of poverty worse in rural areas. They arrived at the conclusion that policy makers should be wary of how the underlying poverty measures have been constructed before using the derived poverty profiles to formulate poverty-reduction policies. However, an appeal of the method is its non-reliance on the need for price data, which can be very problematic in most developing countries.

The method also allows for differences in preferences between subgroups, for the widely culturally, religiously and ethnically diversified societies that many developing countries are, and this is desirable and realistic provision. Further, the method automatically includes an allowance for non-food basic needs consumption, and this is one of its attractions in application to developing country situations (Aigbokhan, 2000).

## **22 Empirical Literature**

Since rural mining is poverty driven its important to determine the whether the residents of Kyasioni mining region are poor. This would help in using the stone mining activity as a source of income with other income sources to reduce the poverty levels among the population.

Since the 1970's studies on poverty have attracted a lot of attention from economists. The development of the FGT (1984) index named after Foster, Greer and Thorbecke, researchers have continued to apply FGT index in their empirical research work.

A study in Uganda on *Peanut Research and Poverty Reduction: Impacts of Variety of improvements on control of peanuts viruses in Uganda* (2003) by Sibusiso Moyo, George W. Norton, Jeffrey Alwang, Ingrid Rhinehart and C. Michael Deom used the FGT index to show that the farmers who had their peanuts crops heavily affected by peanuts viruses remained poor.

Another study carried out using the FGT index was in Osun state, Nigeria on *Adoption of improved Cassava Varieties and its welfare effects on producing Households in Osogbo* (2007) by Amao J.O and Awogen T.T. The study concluded that farmers who used improved cassava Varieties experienced less Poverty prevalence than those who used the old Varieties.

This clearly shows that FGT index has been widely used in measurement of poverty levels in different countries and regions around the world.

Grootaert and Kanbur (1990) conducted a study in Ivory Coast, on Policy Oriented Analysis of Poverty and Social Dimensions of Structural adjustment Programs. This showed the importance of disaggregated data to get sharper insights that will facilitate the relevant policy formulation. Using disaggregated data it was found that rice was not food for poor people. The policy makers had to increase the consumer price index for rice. This helped in getting the right national poverty index.

A study conducted in Indonesia by Huppi and Ravallion (1990) on the Sectoral Structure of Poverty during an Adjustment period in the mid 1980's used the FGT index; found that gains within the rural sector were quantitatively important to the country's success in alleviating poverty during that time. The sector was found to have accounted for over 70% of the reduction of severity of poverty between 1984 and 1987. Further, over half of the gain to the rural farming poor was accountable to the gains to the poor in Central and East Java provinces. The gains to both farm

incomes and wages earnings contributed to poverty alleviation. The government's adjustment program needed to favor the rural areas. In this regard, because of the predominance of poverty in rural areas, the gains to rural farm sector were crucial, and so policy adjustments favoring that sector, such as the devaluation of the exchange rate, probably was important (Ravallion and Huppi, 1991).

In 1993 a study carried out in Indonesia by Ravallion and Bidani (1993) examined measurement practices and how they affected empirical poverty. They used FEI and CBN methods to determine poverty line. Their findings were that using the CBN approach the incidence, depth and severity of the poverty in rural areas was more, whereas the FEI approach showed that all measures of poverty were worse in urban areas. They also found that poverty profile by principal sector employment was less sensitive to the choice of method, particularly in urban areas. In this view they concluded that policy makers should be wary of the underlying differences between methods of estimating poverty measures. The key differences in the two approaches was mainly because the Food Energy intake is determined by other factors besides real incomes such as relative prices, tastes and activity levels.

A case study in Bangladesh by Datt and Ravallion (1998) showed that choice of data base and methods in poverty research are critical. They observed<sup>^</sup> that credible poverty monitoring calls for considerable care in critically evaluating data and methods. On removing what appeared to be the main methodological problems in past estimates they found that there was a reduction in poverty incidence, depth and severity around the mid-1980s, but was not sustained after that. Their study also found that claims by other past studies that Bangladesh urban poverty incidence had overtaken rural poverty incidence was questionable and dismissed the findings. They made conclusions that showed that the slow and uneven progress in reducing poverty in Bangladesh was simply a problem of too little growth coupled with rising inequality and that future economic growth should not be associated with inequalities for the country's poverty measures to respond positively.

Studies in rural India by Datt and Ravallion (1998) estimated that effects of farm yield growth in rural areas in India on various poverty measures, real agricultural wages and relative prices of food, using data ranging for period 1958-1994. They found that higher farm productivity brought both absolute and relative gains to the poor rural households; a large share of the gains was through wages and prices, though the effects took time to be felt. The benefits to the poor were not confined to those near the poverty lines and that inflation had adverse effects on the poor through its short term effects on real wages and food prices.

A study carried by Aigbokhan (2000) investigated poverty profile in Nigeria between 1985 and 1997. In the context of structural policy reforms introduced in 1986, he found that despite the prevalence of real positive economic growth, poverty, inequality and polarization in income distribution had increased during the 12 year period covered by the study. He further observed that in general rural poverty was higher than urban poverty.

In Kenya, many economic researchers have used quantitative and qualitative approaches. In quantitative research, the approach captures the quantifiable and measurable indicators. This method uses the CBN and FEI poverty lines measures. Qualitative approach is also called the subjective approach. It takes the peoples perception of poverty.

In Kenya this was the Participatory Poverty Assessment undertaken by the Government first in seven districts in 1994(Republic of Kenya, 1998a).

A case study on the poverty situation in Kenya, by Mwabu et al (1999) used data from WMS conducted by the Ministry of Planning and National Development in 1994. The study identified the food poor households by using a food poverty line and the absolute poor by using an overall poverty line. Households were deemed poor if they fell below the poverty lines. The study used both the CBN and FEI methods to derive the respective poverty lines. The study found that the national



food poverty lines to be Kshs. 625 and Kshs.609 for CBN and FEI respectively per month.

In Eastern Province where there are several districts including Yatta District which was curved out of the larger Machakos District, the CBN and FEI were Kshs.594 and Kshs.623 per month per adult equivalent. On the other hand the absolute household poverty rates by regions, the study found that the food poverty rate was lower than the absolute poverty rate in rural and urban areas and across all provinces with an exception of Western Province. Eastern and North Eastern Provinces were found to have the worst measures of welfare, irrespective of the method of measurement and the type of measure used. The headcount index for absolute poverty in Eastern and North Eastern provinces varied from 45 to 56%, depending on the type of poverty line that was used to identify the poor. In both provinces, the FEI poverty line was associated with, a higher headcount index, but this was not the case with food poverty.

The FEI line generated a higher food poverty rate only in Eastern Province, where the headcount index was 40%, compared with 51% for CBN line in North Eastern province.

Further, study found that poverty measures were lower in urban areas than rural areas, indicating poverty is more of a problem in rural areas. Poverty inequality and severity were also found higher in rural areas. The study showed that poverty varies substantially by region of residence and by socioeconomic characteristics of households. The social profiles showed that poverty is concentrated among small scale farmers, pastoralists, unskilled workers and polygamous families.

### **2.3 Overview of the Literature**

Since poverty is higher in rural areas according to the literature its important this scenario to be researched on. Measurements of poverty using CBN and FEI methods have had their strengths and weaknesses. The FEI approach though widely used by researchers has its own problems as Ravallion and Bidani (1993) showed. The method suffers inconsistency and can yield differences in poverty lines far in excess of the cost of living differences of the poor. However one very important strength of FEI method is that it can estimate poverty line without data on prices. On the other hand, the CBN method has the problem of setting non-food "basic needs" and in valuing their cost at local prices. Hence due to this problem the CBN method is inappropriate when one tries to achieve consistency. But one strength of CBN method over others is that it controls for differences in purchasing power over basic consumption needs.

In the above studies the FEI method was found more attractive despite its estimation weaknesses. The method is relatively more direct and does not require data on prices and, which in a country such as Kenya availability of accurate data is very difficult.

To measure poverty with some degree of accurateness it's important a method with less arbitrariness is used (Aigbokhan, 2000). That's why the FEI approach satisfies the conditions of minimal arbitrariness. The ability of the method to show other determinants like access to public utilities goods and services automatically includes non-food basic needs in the calculation of absolute poverty line (Mwabu et al 1999).

This review shows the importance' of knowing with certainty the poverty situation at a more disaggregated level. According to Grootaert and Kanbur (1990) in their study in Ivory Coast disaggregated data helps in getting sharper insights that would facilitate the relevant policy formulation. In their study using disaggregated data they found that rice was not a poor man's food. Policy makers, harmed with this

information will better increase consumer price for rice rather than reducing producer price in order to do least damage to poverty at the aggregated national level.

A further review on the Kenyan studies on poverty has revealed that Majority of the studies done in Kenya to analyze poverty have lent to the following assumptions: one the cost of basic needs is the same in all regions across Kenya and that all provinces have a common preference (homogeneous in tastes), thus necessitating a constant rural poverty line across districts, two the studies assumed that a provincial poverty line is fixed for all districts within a particular province, and districts take poverty lines of the provinces in which they are located (Mwabu et al 1999).

For the case study of Kyasioni Quarry in Yatta District, the FGT Food energy Intake Model is the best and appropriate model and methodology to use. This will ensure consistency in the measurement of poverty within the study area.

## CHAPTER THREE

### 3.0 METHODOLOGY

#### 3.1 Theoretical Framework

The study is using expenditure rather than income, housing and the ability to afford welfare as key indicators. Using consumption expenditure over income has the following advantages; one measuring income is more problematic than measuring consumption in that rural households' income is mainly from self-employment in agriculture, animal keeping and activities such as rural stone mining and ballast making. Data on income is very hard to collect as majority of the people have a problem in reporting this information correctly or plainly refuse to give the right information (Republic of Kenya, 2007a).

Moreover, given that annual income is necessary for satisfactory measure of living standards, an income-based measure requires multiple visits or the use of recall data, whereas consumption measure can rely on consumption over the few weeks (Deaton, 1997).

#### 3.2 Model Specification.

##### 3.2.1 Constructing FEI-based poverty lines

Following Mwabu et al. (1990), the food and overall poverty lines was derived from regression equations as shown below:-

$$\text{Log Food Expenditure} = a + \beta_3 (\text{calories}) + s \dots \dots \dots (1)$$

$$\text{LogCalories} = \gamma + \beta_1 (\text{LogTotalExpenditure}) + \beta_2 (\text{Log Total Expenditure})^2 + v \dots \dots (2)$$

Log Food Expenditure = log of household food expenditure per adult equivalent per month;

Log Total Expenditure = log of total household expenditure per adult equivalent per month;

Log calories = log of Kilocalories per adult equivalent per month;

E And v are disturbance terms while a,  $\beta$ ,  $\gamma$ , and  $\beta^2$  are parameters to be estimated.

Expression (1) is the equation used by FGT (1984) and by Greer and Thorbecke (1986) to estimate poverty lines. The log-linear specification of equation (1) is chosen because of its desirable properties and good fit: given some level of calorie consumption, the elasticity of calorie consumption with respect to food expenditure is positive and decreases with an-increase in expenditure (Greer and Thorbecke, 1986). Further, equation (1) represents the cost of achieving a desired level of calories, which is analogous to the cost of producing a given level of output in production theory (Mwabu, et al. 1999). After estimating the parameters of equation (1), the food poverty line was obtained from the formula below:-

$$\text{Food Poverty line} = \exp \{a + p (\text{calories})\} \dots \dots \dots (3)$$

The overall poverty line was computed by estimating the parameters of expression (2), which is a quadratic Engel curve (This relates income to demand for commodities demand is derived from an income expansion path).

Using quadratic formula the overall poverty line can be determined.

According to Mwabu et al (1999), the level of income required to reach kilocalories 2,250 per adult equivalent per day in equation (2) automatically includes an allowance for non-food items, and thus equation(2) is very convenient in constructing overall poverty lines.

### 3.2.2 Poverty Measures

A lot of information exists on different ways of measuring poverty. The FGT index as seen in the review and designed by Foster, Greer and Thorbecke (1984) has been extensively used by researchers as a poverty measure. This study will use the same index to come up with poverty measures for the study area of Kyasioni stone mining region.

The FGT measure P (a) given as

0 )

Where

Pa = a measure of absolute (or food) poverty

Yi = total expenditure of household i per adult equivalent (i= 1, 2 . . . N)

z = poverty line expressed per adult equivalent

N = total number of households

q = total number of poor households

a = FGT parameter, which may be interpreted as a measure of poverty

Aversion for a > 0

This index summarizes information on the poverty level, depth and inequality for the food overall poverty or the hardcore poverty in any society.

The quantity in parenthesis is the proportionate shortfall of income below poverty line. By increasing the value of a, the "aversion " to poverty as measured by the index is increased where no aversion to poverty the a =0, the index is given as

$$P(a) = \frac{1}{N} \sum_{i=1}^q \left( \frac{z - Y_i}{z} \right)^a \quad (2)$$

This gives the headcount ratio of poverty. The number of poor people as a percentage of the total population for whom consumption Yi is less than the poverty line z.

Some certain sorts of poverty comparison like overall progress in reducing poverty may be adequately explained by this index. The headcount index as drawbacks especially when checking how far below the poverty line each poor person is. It cannot show the depth of poverty. The headcount index also forces the overall poverty to remain constant even when the welfare of the poor has improved or worsened.

If the degree of aversion to poverty is increased so that a = 1 the index-becomes

$$P_1 = \frac{1}{N} \sum_{i=1}^q \left( \frac{z - Y_i}{z} \right)^1 \quad (3)$$

This gives the poverty gap in the population.

The poverty gap is based on the aggregated poverty deficit of the poor relative to the poverty line. This gives a good indication of the depth of poverty. ~ This gives a good indication of the poverty depth, in that it depends on how far below the poverty line are the poor. It measures the shortfall of the average income of the income of the poor relative to the poverty line. It can also be used to estimate the resources that would bring the expenditure of every poor person up the poverty line hence eliminating absolute poverty.

The resources in total required to eliminate poverty is given by  $N, P, z$  (Boateng et al, 1992 and Mwabu et al, 1999). However, two main drawbacks of the poverty gap are that, it's insensitive to the number of poor and it does not take into account the inequality of the income among the poor (Kakwani, 1980).

The severity of poverty which is additive can also be measured using the FGT P2 measure. Using this measure, the poverty gaps of the poor are weighted by those poverty gaps in assessing aggregated poverty.

Taking  $a = 2$ , then

$$P_2 = \frac{1}{N} \sum_{i=1}^q \left( \frac{z - Y_i}{z} \right)^2$$

The above measure helps in determining the severity of poverty among the poor. It's a superior measure than the first one.

The severity of poverty is determined by squaring the poverty gap and it increases more than proportionately with the poverty gap.

Higher index helps to show if poverty is severe or less severe. The measure is useful when comparing policies as to reach the poorest but it's not easy to interpret (Ravallion, 1992).

This measure can be thought of as the sum of two components: one amount due to the poverty gap and the amount due to inequality among the poor. From equation (4) when  $Y_i = z$ ,  $P_a = 0$  means there are no poor people in the population. Moreover, as FGT parameter approaches infinity, the poverty measure  $P_a$  as approaches infinity. This means the poorest households therefore accounts wholly for the magnitude of the poverty in the population. It makes the poorest person the focus of poverty reduction efforts in the society (Mwabu et al, 1999, Kimalu et al 2007 and Gongi, 2005).

Further when  $Y_i > z$ ,  $P_a = 0$  because by definition there is no poverty when households income is above poverty line. This is because the measure  $P$  is completely invariant with respect to changes in the income of people above the poverty line and depends only on the income of the poor ( Sen., 1996).

### **3.2.2 Data Type and Sources.**

Since this is a case study the data to be used for this research is primary data which will be collected at the research site. This will be on the Kyasioni Stone Mining Quarry. The data collected will include people spending patterns, education level, the number of dependants, the kind of housing, other sources of income and ability to join welfare groups. This data will be used to analyze the poverty level of the people and form the basis for policy recommendations on how to use this rural stone mining economic activity to reduce poverty level in the stone mining region. Being primary data the respondents will be interviewed on site to give information on their spending patterns and levels hence this information will be used to determine the poverty levels and poverty aversion.



In order to collect the required data there is a questionnaire attached. In this stone mining region there are about one hundred (100) mining holes covering four square kilometers (4 sq Kms) with each having about ten (10) miners.

The population frame is about one thousand (1000) miners and intent to interview two (2) people per mining hole. This will enable me to have a sample frame of two hundred (200) miners for this study.

## CHAPTER FOUR

### 4.0 DATA ANALYSIS

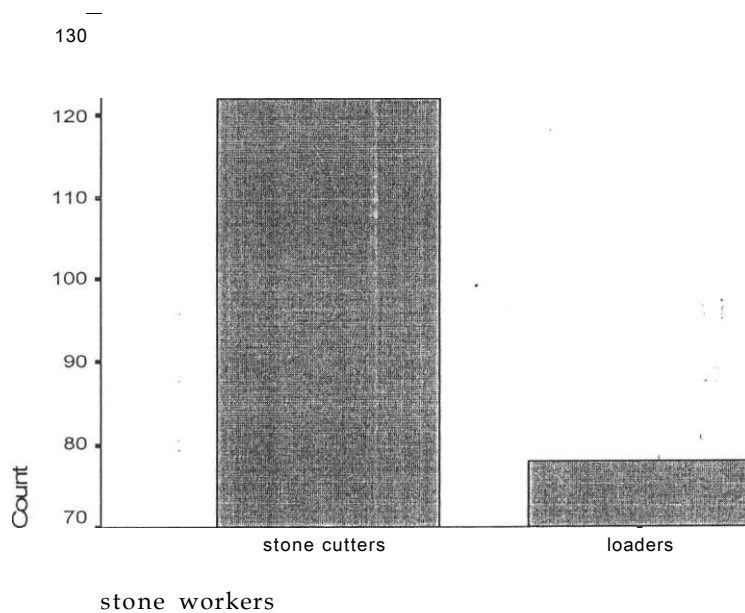
#### 4.1 Data analysis and Empirical Results.

##### 4.1.1 Summary statistics of the variables used in the study.

In the study the key variables used are category of workers, level of education, reasons for doing stone mining, how much each worker spends per month and the type of housing each live in.

Using general determinants of poverty and graphical analysis the following results can be arrived at:

**Graph 1: Category of Workers**

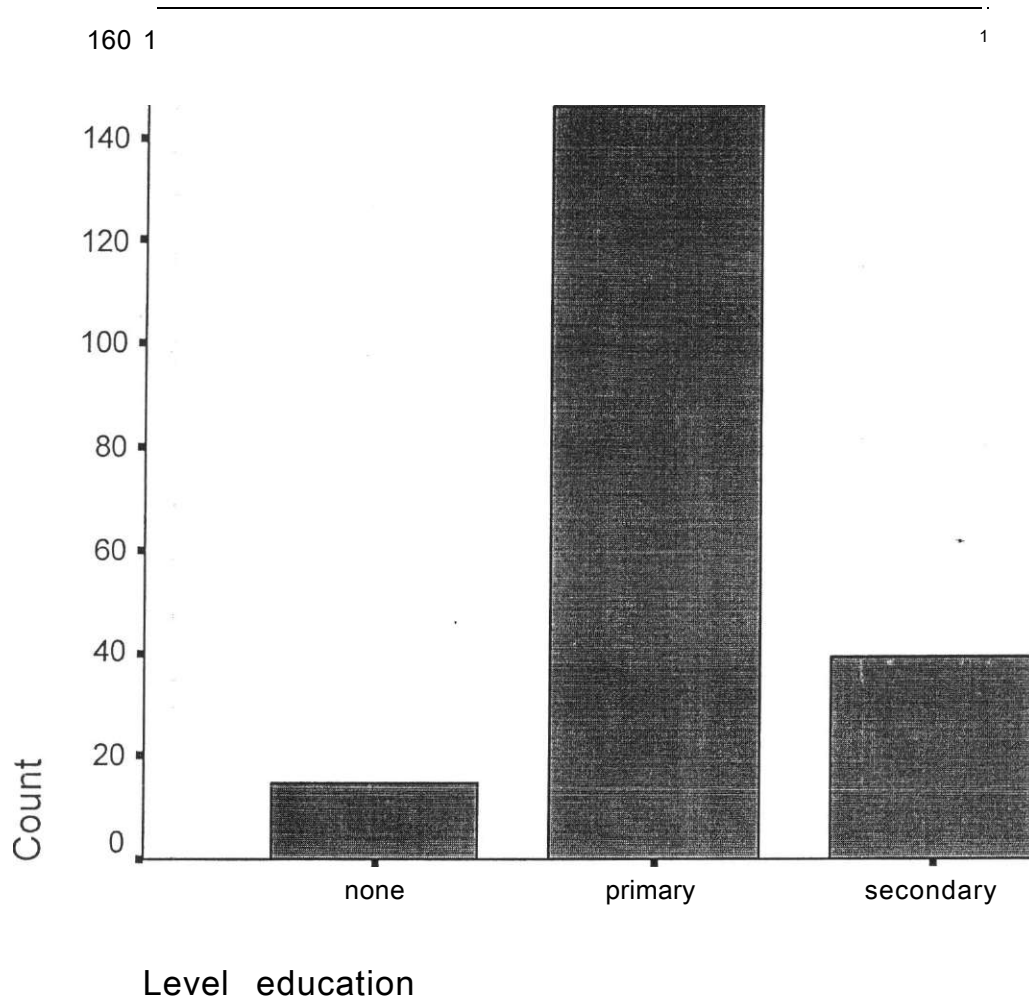


From the above graph, its clear that majority of the stone workers in Kyasioni Quarry are Stonecutters. Over seventy percent of the workers are Stonecutters and the remaining thirty percent are loaders.

The exercise of cutting stones is done manually and is usually a very demanding job. The workers do the digging up of the earth then the cutting of stones using hand

tools. Considering their spending this group of workers can be concluded poor since they constitute a large part of the sampled population.

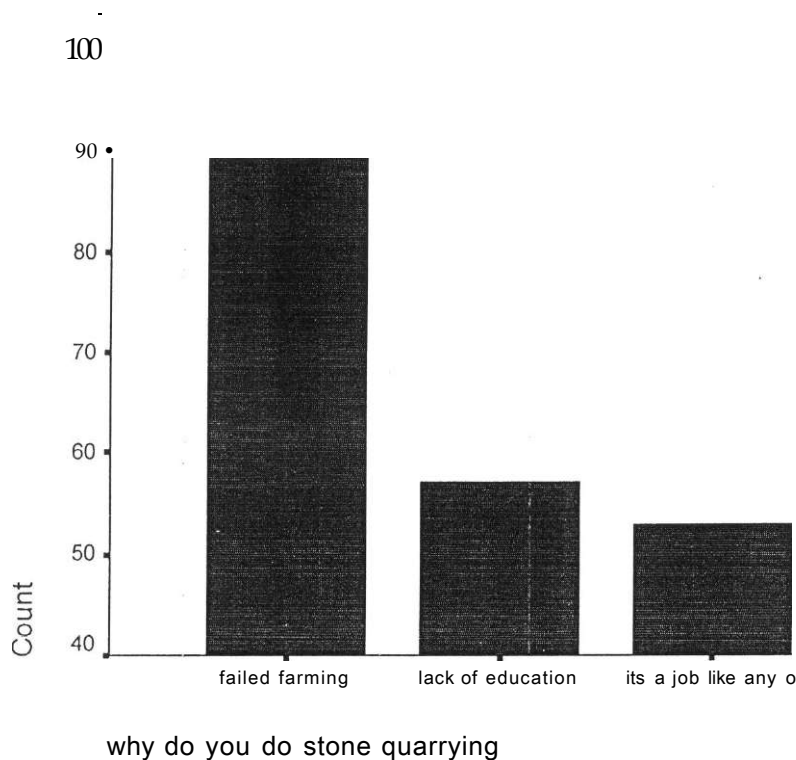
**Graph 2: Level of education**



Education is the key to the success of a community. From the analysis above its clear that most residents within Kyasioni quarry are educated only up to attaining primary, secondary education. Others have no education at all. Lack of education is one key indicator of poverty according to the United Nations Fluman Development Index indicators.

With low literacy levels, the people working at Kyasioni quarry are a vulnerable group. They are prone to exploitation by the quarry owners, intermediaries and transporters. This occurs in form of low pay, poor working conditions and lack of job security making them work regardless of the risks involved in the work.

**Graph 3: Why you do stone quarrying**



According to the workers in this quarry the reasons that drove them into stone quarrying is failed farming, lack of education and is a job like any other.

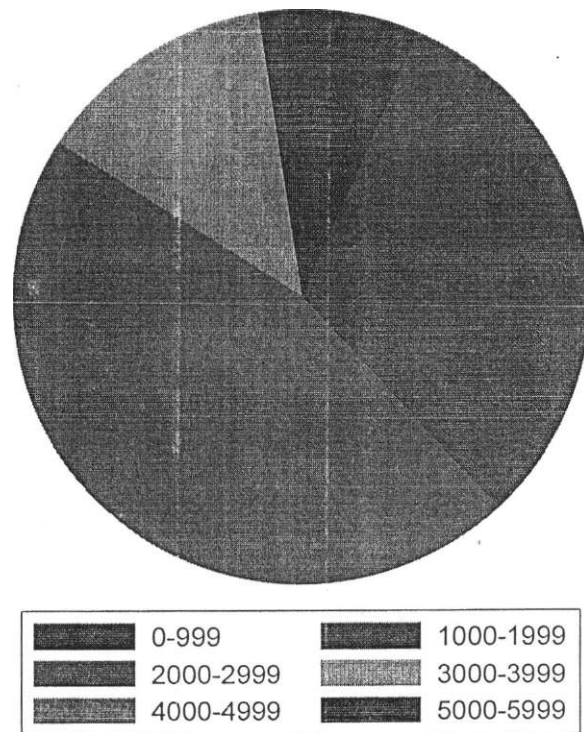
The above graph clearly shows that the main reason why these residents do stone mining is due to failed farming activities. Since Kyasioni quarry is located in Yatta District where climatically the rains are poor leading to low yields or no yields at all, to survive they turned to mining as the only source of livelihoods for survival.

Failed farming has consistently driven the workers in Kyasioni quarry into poverty hence stone mining became the only means of earning income for sustenance. Since farming is the only economic activity in his region, with failed rains they lack any

other means of earning a living hence they are forced into mining as a way of feeding and raising the families during this hard economic time.

Using this reason it clearly explains why small scale mining is poverty driven hence those working in his mining region are classified as poor. Also lack of education was another factor contributing to people being involved in stone quarrying. A number of these workers lack education which drove them into stone quarrying. Without education the residents of Kyasioni could not secure other well paying jobs apart from stone quarrying hence the conclusion that they are poor.

**Graph 4: Monthly spending**



According to the World Bank development report attacking poverty (2000) any person spending or living under two dollars per day is classified as poor. This is equivalent to Kshs. 200 per day. According to the World Bank every adult should

spend six thousand shillings per month to considered non poor or above the poverty line. From the pie chart above none of the stone workers in Kyasioni spends over six thousand per month hence all are spending below the poverty line. This shows that all the stone workers at Kyasioni quarry spend less than two dollars per day hence all are poor as outlined in the World Bank report attacking poverty (2000).

This has been because of the low wages offered by the quarry owners to the stonecutters who form the biggest work force in his quarry. The low wages have contributed heavily in making the people poor.

**Graph 5: Type of Housing you live in**



Housing is an integral measure of how poor the people are. The above graph shows that majority of the stone workers in this quarry live in temporary and semi permanent houses. A small number, lives in rented houses and others in permanent houses.

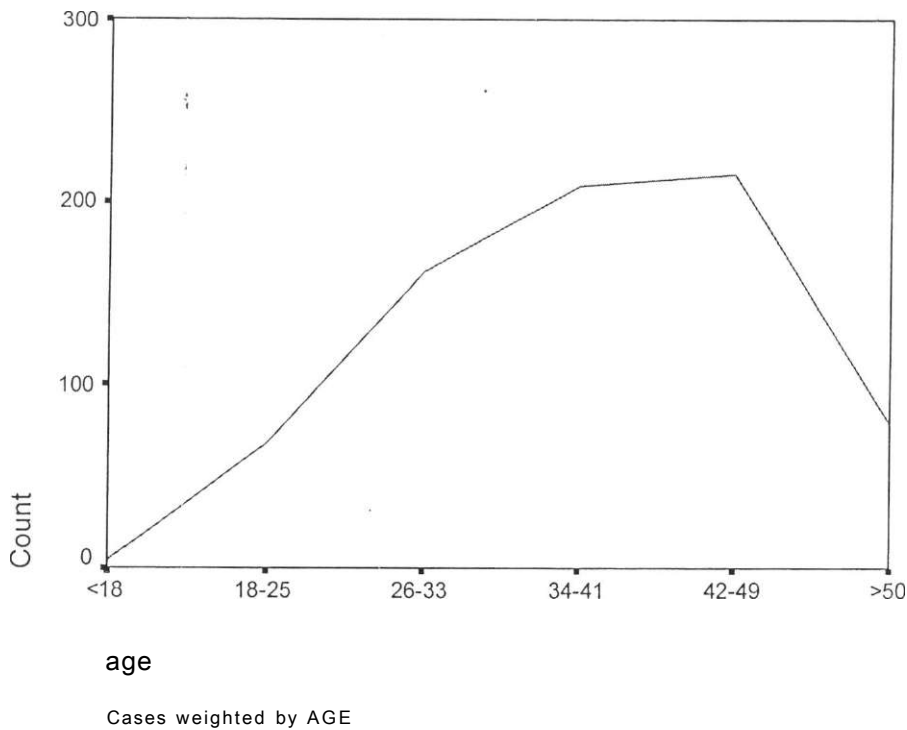
Poor housing is an indication of poor people. With most of the stone workers living in very deplorable houses, clearly the workers can be classified as a working poor population.

With most of the workers unable to afford decent houses then they are classified as poor. The UN report on Human Development Index (2002), inability of people to afford decent housing is a clear indication that they are poor.

From the above graph, it is clear that most of the workers live in houses that depict them as poor. This is due to the low wages paid by the quarry owners to the

Stonecutters and loaders. With the low wages the workers cannot afford to build good decent houses hence these people are categorized as poor.

**Graph 6. Age of the workers**



The above graph illustrates the ages of the workers put in categories. Looking at the graph it clearly shows that most of the workers ages range between the 18 years to 50 years. However on average most workers ages are between 26 years to 49 years. This shows that most workers in Kyasioni quarry are at their most productive age hence should produce more and earn more due to both their great physical and mental capabilities. On the contrary they spend very little because their earnings are very low compared to the amount of work they do in a day.

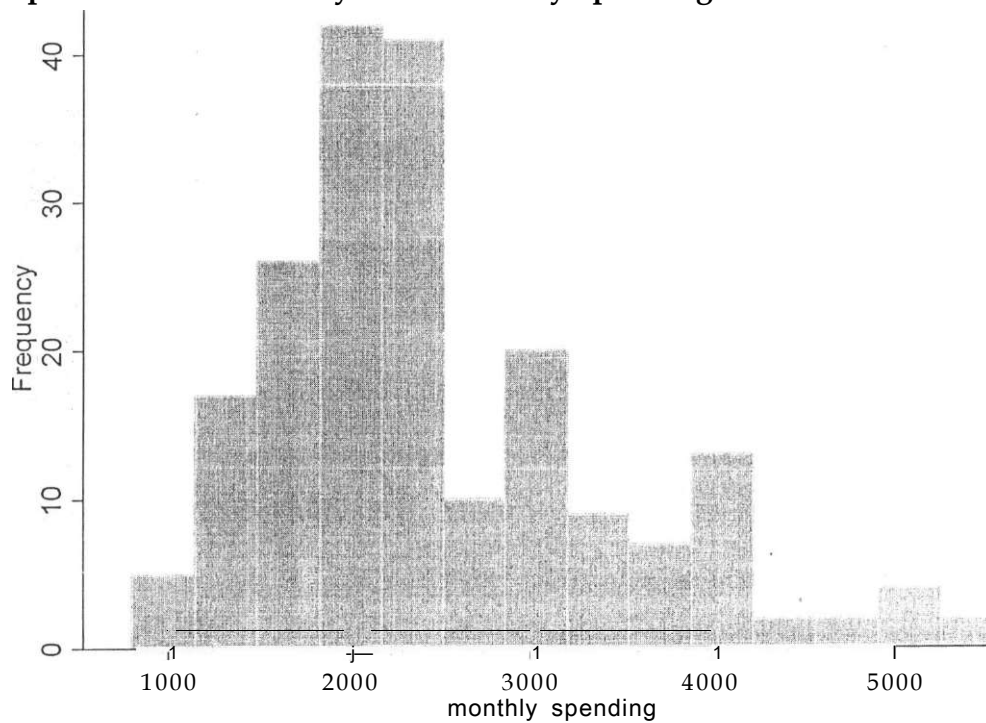


#### 4.1.2. Empirical Analysis.

Using the FGT model we determine empirically if the population sampled is poor. The key variables were the workers consumption of food and non food items, housing and level of education. To determine the poverty lines the FEI method was used to determine the poverty lines. The FEI poverty line will be based on two dollars per day which is equivalent to Kshs. 200 per day and six thousand Kenya shillings per month.

The histogram below summarizes the monthly spending per household per month.

**Graph 7. Statistical Analysis of Monthly spending**



The above histogram shows that all the stone workers Kyasioni quarry spend less than six thousand Kenya shillings. They spend less than the recommended two dollars a day according to the World Bank recommended spending level of two dollars per which is approximately two hundred Kenya shillings per day which

translates to approximately six thousand shillings every month per household. In addition to the low spending they are uneducated, live in temporary and semi permanent houses and have large number of dependants. The stone cutters constitute 61% of the sampled population of workers while the loaders 39%.

Most of the uneducated workers also live in temporary and semi permanent houses, this clearly shows that there is a correlation between lack of education, poor housing and poverty. From the analysis using poverty as the base outcome its clear that all workers classified as poor lack decent housing.

The likelihood of those workers who spend very low being poor was very high. It was easy to conclude that the lower you spend the higher the chances of being poor, from the same analysis there are more poor stone cutters as compared to loaders. Out of the 200 sampled workers 109 live in temporary houses and 46 in semi permanent houses. This represents 74% of the sampled of the workers.

**Table 1. Summary of monthly Spending**

Monthly spending	Freq.	Percent
800	1	0.50
900	3	1.50
1000	1	0.50
1200	7	3.50
1300	5	2.50
1400	5	2.50
1500	3	1.50
1600	8	4.00
1700	10	5.00
1800	5	2.50
1900	7	3.50
2000	23	11.50
2100	12	6.00
2200	9	4.50
2300	8	4.00
2400	14	7.00
2500	10	5.00
2600	2	1.00
2700	2	1.00
2800	6	3.00
2900	11	5.50
3000	8	4.00
3100	1	0.50
3200	3	1.50
3300	1	0.50
3400	2	1.00
3500	3	1.50
3600	1	0.50
3700	3	1.50
3800	3	1.50
3900	4	2.00
4000	7	3.50'
4100-5600	12	0.75
Total	200	100

The table shows that all the sampled workers spend less 6,000/- Kenya shillings. According to the World Bank report (2000) on attacking poverty any person spending less than two dollars per day is classified as poor.

**Table 2. The Type of Housing workers own or Jive in.**

<b>House type</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cumm.</b>
Temporary	114	57.0	57.0
Rented	9	4.50	61.50
Semi permanent	66	33.00	94.50
Permanent	11	5.50	100.00 .
Total	200	100	

According to the UN report on Human Development Index (2000) decent and good is a key indicator of people who are above the poverty line. In the table above the workers mainly live in temporary, rented and semi permanent houses.

Using the UN report as reference then these workers are in the category of the poor.

**Table 3. Education Level**

<b>Edn. level</b>	<b>Freq.</b>	<b>Percentage</b>	<b>Cumm.</b>
None	15	7.50	7.50
Primary	146	73.00	80.50
Secondary	39	19.50	100.0
Total	200	100.00	

Basic education in Kenya consists of both primary and secondary education. Education enhances the people's economic and social empowerment. The workers in this quarry lack education which key to economic and social success of the society. From the table out of the 200 workers sampled only 39 workers had attained secondary education and 161 workers had either no education or primary education only. This leads to conclusion that in this stone mining region education levels are low and hence to encourage people to embrace education and take advantage of the free primary education.

**Table 4. Other income Sources**

<b>Others sources of Incomes</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cumm. Freq.</b>
Crop. Farming ,	178	89.00	89.00
Animal Keeping	5	2.50	91.50
Remittances	4	2.00	93.50
None	13	6.50	100.00
Total	200	100.00	

Yatta District is predominantly inhabited by Kamba people who practice small scale farming for basic subsistence consumption. This activity is done on small parcels of land. Since whatever is produced is never enough for the large numbers of dependants for the stone workers they had to turn to the activity stone mining to provide the badly needed income to support their families and relatives. With the changing climatic and weather patterns rainfall has consistently been failing in virtually the whole of Yatta Districts. Rainfall failure has left the residents of Kyasioni with no other income source other than small scale stone quarrying.

**Table 5. Do you belong to a Self Help Group?**

<b>Self help group</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cumm.</b>
Yes	178	89	89.00
No	22	11	100.00
Total	200	100.00	

The above table shows that 89% of the stone workers belong to a village self help group. The main reasons were to cater for burial expenses when a villager or one of the stone workers dies. Their incomes are very low hence they are unable to form locally based Savings and Credit Cooperative Societies to improve their welfare.

**Table 6. Category of worker.**

<b>Category of worker</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cumm.</b>
Stone cutter	122	61	61.00
Loader	78	39	100.00
Total	200	100	

With over 61% of the workers sampled being stone cutters it clearly shows that at Kyasioni quarry small scale stone cutting can be a very good employment creation and can help sustain the livelihoods of the people who work at this quarry and also the community around this quarry by creating income inflows through better trickle down effect. . It shows on average the workers sampled were stone cutters. In this region stone cutters were more than the loaders.

**Table 7. Age of the workers.**

<b>Age category of the worker</b>	<b>Freq</b>	<b>Percent</b>	<b>Cumm.</b>
<18	4	2.00	2.00
18-25	34	17.00	19.00
26-33	54	27.00	46.00
34-41	52	26.00	72.00
42-49	43	21.00	93.00
>50	13	6.50	100.00
Total	200	100.00	

Looking the age of the stone workers at the Kyasioni quarry it shows that most of the workers have worked in the quarry for a long time. The age of the workers shows that most of the workers ages range between 18 years to 50 years. Majority of the workers ages are between 18 years to 49 years. This is the most productive age in a population hence should produce more and earns more.

**Table 8. Marital Status**

<b>Marital Status</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cumm-</b>
Single	41	20.50	20.50
Married	149	74.50	95.00
Widow	0	0	95.00
Widower	8	4.00	99.00
Separated/divorced	2	1.00	100.00
Total	200		

Most of the sampled workers were males. From the table 20.50% were single while 74.50% were married with families and a number of dependants. Only 4% were widowers and 1% separated and divorced. Since the stone workers are family people its clear that they have dependants who need their support in terms food, clothing, shelter, health care and education.

**Table 9. Why you do stone quarrying**

<b>Reasons for stone quarrying</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cumm.</b>
Failed farming	90	45.00	45
Lack of education	57	28.50	73.50
The only available job	53	26.50	100.00
Total	200	100.00	

Kyasioni quarry is in Yatta District which is inhabited by Kamba people who are small scale farmers. Most of the produce which includes maize, beans, sorghum, millet and cowpeas is made for consumption. In the past 10 years farming has consistently failed due to erratic rains possibly due to global warming. With n other means of survival the residents of Kyasioni stone quarrying region turned to small scale stone quarrying as the only economic activity to sustain their livelihoods during these hard economic times.

**Table 10. Specific family members involved in stone quarrying.**

Family members doing stone quarrying	Freq.	Percent	Cumm.
Child	22	11.00	11.00
Relative	121	60.50	71.50
None	57	28.50	100.00
Total	200		

From the above stone quarrying at Kyasioni is a family affair. Most of the worker is done by related family members. Looking at the results 11% of the respondents confirmed they work at the quarry with their children. From the table 60.50% of respondents admitted they were introduced to this activity by their relatives hence they work with them at the quarry. This shows that stone quarrying at Kyasioni is done by people who are related leading to poverty across the population since all of them face the same problems day in day out at the quarry.

**Table 11. Number of Dependants.**

No. of dependants	Freq.	Percent	Cumm. Freq.
None	54	27	
1-5	85	42	
>5	61	30	
Total	200	100	

As its characteristic in rural areas most rural families have many dependants leading to high dependency ratio. In Kyasioni stone quarrying region the number of dependants ranges between 0 to over 5 dependants. From the above table 72% of the house holds have dependants between one and over five. Considering their monthly spending this is a very large number of persons per household which will lead to dilution of their resources hence low levels of investments, lack savings and



eventually poverty. High population growth rate is a key indicator of a poor population. Also high dependency ratio as been used as a tool for determining the level of poverty in a population. The high dependency ratio at Kyasioni quarry is an indicator of poor people.

**Table 12. Income Changes due to Stone quarrying.**

<b>Status Changes due to quarrying</b>	<b>Freq.</b>	<b>Percent</b>	<b>Cumm.</b>
Income change	166	83.00	83.00
Marital status	6	3.00	86.00
Children education	28	14.00	100.00
Total	200	100.00	

Kyasioni quarry is located in an agricultural region. Due to the prevailing climatic changes in Kenya farming has been performing poorly in this region. For the residents to provide for their families they turned to small scale stone quarrying. This economic activity as become the sloe income provider for the workers in Kyasioni. This income has bee very instrumental in supporting families' daily sustenance. Over 83% of the workers used the income to feed their families, 3% used to pay their dowry and 28% to educate their children in primary schools. However it was clear from the workers that this income is too little to educate children in secondary schools and colleges and other tertiary institutions.

#### **4.1.3. Estimation Procedure.**

Using the FEI method the nominal consumption per household consisted of two components: food and non-food consumption. This was done using the best-practice guidelines provided in Deaton and Zaidi (2002). The food consumption aggregate included four components namely: food consumption derived from purchases, own production, own stock and *gifts e.g. relief food and others*. The food consumed consisted of the following sub-groups cereals, animals fat, vegetables sugar non-

alcoholic beverages and food eaten in hotels and canteens. The main non-food subgroups were primary education and alcoholic beverages.

Some expenditures were excluded especially marriages, dowry and taxes since they could not improve the welfare of the people but only make it worse.

Determining calorie content of food items consumed by households was done by the use of the National Public Health Laboratory Services (1993) report, which provides detailed information on the nutrients content and calorie composition of items in Kenya. The household calorie consumptions were standardized by dividing them with adult equivalent units in a household and then computed for a month. The expenditure values of consumption from own production, own stock, gifts and other sources were computed by use of imputed median cluster prices for the specific food items.

When  $a=0$  the headcount ratio is 100%. This shows that all the stone workers sampled at the quarry are all poor. The headcount ratio explains the total number of the poor within the sampled population. From the results it can be concluded that the stone workers are all poor.

When  $a=1$  the poverty gap ratio is 99.7%. The poverty gap ratio explains how far below the poverty line a population is. The workers in Kyasioni quarry are way below the poverty line. This clearly shows the workers are absolutely poor.

When  $ci=2$  the severity of the poverty is 99.7%. The workers are categorized as severely poor. Their poverty is as a result of their low levels of spending on both food and non-food items. The low level of spending is due to the low earnings

**Table 8. Kyasioni Stone Mining Region Poverty Measure (Sample Size=200)**

Poverty measure	Magnitude in %
Headcount index for Po for a=0	100
Inequality index (Poverty gap) PI for a=1	99.756
Severity Index for P2 for a=2	99.756

The total monthly spending per household in this region is 800-5600 Kenya shillings. The lowest spending level per worker is 800 Kenya shillings and the highest spending is 5,600 Kenya shillings. On average each stone workers should spend 2,474 Kenya shillings per month. The poverty for Yatta is set at two dollars a day (equivalent of Kshs. 200) which is as per the World Bank report on attacking poverty (2000).

Using expenditure for both food and non-food items was the most appropriate method of determining how far below the poverty line the people fall. With these results a conclusion can be drawn that Kyasioni stone mining region has very high poverty levels leading to an increase in the poverty levels in the country.

As indicated earlier the headcount ratio is the most popular of the FGT measures. The headcount ratio is the ratio of the number of poor individuals in the population. This ratio shows the rural absolute poverty of the population in the Kyasioni stone mining region stands at 100% while the poverty gap is 99.756%. From the sampled population then it is concluded that all the stone workers sampled out are poor.

The national poverty rate for Yatta District where Kyasioni is located is 60.4%. This percentage is far lower than the rates the study is giving which indicate 100% of the sampled workers are poor. This calls for use of disaggregated data at higher level on poverty analysis with a view of providing the insight information to facilitate the development and implementation of the relevant policies, interventions, programs and activities to reduce poverty in the Kyasioni stone mining region. The headcount

ratio (PO when  $a=0$ ) was constant and played a role in assessing the overall progress in reducing poverty in Kyasioni stone mining population. However, the headcount ratio does not take into account how far below the poverty line each poor person is. Due to its constant nature it forces overall poverty index to remain constant even if the welfare of the poor has improved or worsened in the Kyasioni. This was expected from the theory as explained in chapter three on the methodology.

One key finding in the study is on average, the poor have large households. (Many dependants) leading to a high dependency ratio. According to the 1994 welfare monitoring survey (Republic of Kenya 1998b); the average household size for the poor was over 5 members. In this study over 70% of the stone workers had many dependants. (Over five members).

On rural poverty, with over 70% of the households having large families, this tends to dilute the available families resources and income, diverting the family budget to food hence little is left for education, health, investment and housing. This goes in line with Engel's law which states that relative to non poor, the poor spent a higher percentage of their income on food. In this study as expected the poor spend 80% of the income on food expenditure and very little 20% on education, housing, investment and less on permanent investments.

The poverty gap for overall poverty gap is 99.756%. This gap measures the shortfall of the average income of the poor relative to the poverty line. In this area (Kyasioni stone mining region)- The population of stone workers has a huge income shortfall of the people at the poverty line.

The severity index of the people in this rural area is 99.756%. This measure gives the severity of poverty among the sampled, population. This index is measured by the square of the poverty gap and increases proportionately as the poverty gap. This is a superior measure of poverty than headcount ratio and poverty gap index.

## CHAPTER FIVE

### 5.0 CONCLUSION AND POLICY RECOMMENDATIONS

#### 5.1 Conclusion.

This study was aimed at determining the poverty level at Kyasioni stone mining region in Yatta district Machakos County. The focus of this rural area was basically because literature shows that poverty is a rural phenomenon and small scale mining is poverty driven. The study used FEI method, which is an alternative to CBN to come up with the Kyasioni stone mining region poverty levels, which were used to compute poverty measures. Despite its limitations in estimation, FEI method was preferred because it is relatively more direct, consistent and does not require data on prices.

As discussed in the theoretical framework the study used expenditure rather than income as an indicator of welfare. This is because in the context of measuring welfare in developing countries like Kenya, there is a strong case in favor of using measures based on consumption and not income. This is because very few respondents will be willing to reveal their level of earning as compared to their willingness to disclose their spending patterns. At the practical level, the difficulties of measuring income are much more severe than those of measuring consumption, especially for rural households whose income is largely from stone mining activities in the region.

Kyasioni stone mining region's overall poverty line was Kshs. 1,562/-. The poverty line was computed using FEI method. Further, literature shows that, FEI method allows substitution of expensive goods with cheap one unlike when using CBN method which may yield lower poverty lines.

The region poverty levels show that most of the stone workers in Kyasioni are very poor. This has led to higher poverty lines for the region.

Increasing numbers of people have turned to stone quarrying at Kyasioni to seek alternative livelihoods due failed farming as a result of erratic rains.

The contribution of this sub-sector to income generation and employment creation, especially in rural areas is not negligible. Small scale stone mining at Kyasioni has helped reduce migration of youth from rural areas to urban areas.

In general small scale mining has the potential to catalyze development and also foster economic multipliers. However the sector is plagued with many problems including isolation from mainstream of economic development, environmental degradation and sub-optimal exploitation of resources due to use of rudimentary technology, health and safety hazards and crime.

As a model of small scale mining Kyasioni quarry is facing many problems of which some are associated with limited capacity, lack of assets and entitlements of the community that live around the mines.

## **5.2 Policy Recommendations**

This paper proposes the adoption of a pluralist, holistic and multi-pronged approach that goes beyond providing the right technology options to make small scale stone mining in Kyasioni a viable economic activity. The approach is based on the provision of affordable and accessible technology to small scale stone workers. There is need for formalization of the sector and development of diversified and alternative livelihoods to the small scale stone workers. This includes skills like farming, carpentry and bricklaying.

This would help in diversifying income sources and broadening the non-mining incomes. This recommendation has been necessitated by the fact that most of the stone workers earn so little that they barely survive. This means the money that flows into the quarry daily has very poor trickle down effect to the residents.

The Yaonde Vision (2004/2006) on small scale mining provides a good frame work for development of the small scale mining sub-sector in Africa. The Vision recognizes Small scale mining as poverty driven activity and recommends that it

should be integrated in the poverty Reduction strategy papers of Africa Governments.

It further urges that mining policies and laws of member states should be reviewed to incorporate a poverty reduction dimension in small scale mining strategies. Equally important is the framework provided by the Strategy Plan (2004-2006) of the communities and small scale mining; global forum for knowledge sharing and coordination between the various institutions working on small scale mining.

Sustainability of the small scale mining can be enhanced if mineral wealth is invested during the currency of mining on human and social capital creation and partly on the an income-generating portfolios of financial assets that yield returns than mining . Development outcomes of this small scale stone mining can be also enhance if coalition of change with increased, informed and meaningful participation of local members of the community and other stakeholders in decision making and implementation of extractive industry projects are promoted. This should be coupled with better understanding and factoring of local, context and specificities and better integration of mining in local economies, development plans and poverty reduction strategies.

If and only if when this policies are put in place we can be able to realize meaningful contribution of the Kyasioni quarry which has been in existence for over 35 years contributing to poverty reduction and enhancing trickle down effect of the funds that circulate in this region benefiting the stone workers and the residents of Kyasioni stone mining region.

## REFERENCES

- African Development Bank,(2000), *Gender, Poverty and Environmental Indicators on African Countries, The Poverty-Environment Nexus in Africa*, Economic and Social Statistics Division, Statistics Department, African Development Bank Tunis Tunisia.
- Aigbokhan, E.B. (2000), "Poverty, Growth and Inequality in Nigeria: A case Study ", Africa Economic Research Consortium (AERC) Research Paper 102, Nairobi November.
- Anzangi, S.K. and Bernard, F.E. (1977), *Population Pressure in Kenya: A Preliminary Report*, Central Bureau of Statistics, Nairobi.
- Atkinson, B.A. (1987), "On the Measurement of Poverty", *Econometrica*, Vol. 55, No. 4, pp.749-764, July.
- Amutabi, (1992). *Mining in Mukibira Gold Mines Viliiga District*, Journal for Gender Development
- Boateng, O.E. Ewusi, K. Kanbur, R. and McKay, A.. 1992, "A Poverty Profile for Ghana, 1987-1988, *Journal of African Economies*, Vol. 1, No. 1, pp.25-58, March.
- Bernd Dreschler, (2001) *Small-scale Mining and Sustainable Development within the SADC Region*. Mining, Minerals and Sustainable Development.
- Chiang, A.C. and Wainwright, K. (2005), *Fundamentals Methods of Mathematical Economics*, Fourth Edition, McGraw-Hill Companies, New York.
- Cullman, G. and Labonne, L. (1999), *Sustainable Small-scale Mining in Third World Countries: The Way Forward*.
- Datt, G and Ravallion, M (1998), "Farm Productivity and Rural Poverty in India", Food Consumption and Nutrition Division Discussion Paper, No. 42, International Food Policy Research Institute, Washington, D.C. March.
- Deaton, G. (1997), *The Analysis of Household Surveys: A Micro econometric Approach to Development Policy*, Washington and London, World Bank and The Johns Hopkins University Press.
- Deaton, A and Zaidi, S (2002) *Guidelines for Constructing Consumption aggregates for Welfare Analysis*. LSMS Working Paper No. 135, Washington, D: The World Bank.
- Foster, J. Greer, J and Thorbecke, E. (1984), "A Class of Decomposable Poverty Measures", *Econometrica*, Vol.52 No3, pp761-766.



Granzow, S. (2000), *Our Dream: A world Free of Poverty*, The World Bank, Oxford University Press, Inc. New York, U.S.A.

Grootaert, C. and Kanbur, R. (1990), "Policy-Oriented Analysis of Poverty and Social Dimensions of Structural Adjustment: A Methodology and Proposed Application to Cote d' Ivoire, 1985-88", SDA Working Paper, Policy Analysis, Washington D.C., The World Bank.

Huppi, M. and Ravallion, M. (1990), "The Sectoral Structure of Poverty during an Adjustment Period: Evidence for Indonesia in Mid-1980's", Policy Research and External Affairs Working Paper 529, The World Bank.

International Institute of Environment and Development, (2003)  
*Mining in Third World Countries*, the Yearly Report.

Jennings, G. (1999), *Mining and Sustainable Development in Third World Countries*. A Critical look.

Kakwani, N. (1980), "On a Class of Poverty Measures", *Econometrica*, Vol. 48, No. 2, pp 437-446

Kakwani, N., Khandlker, S. and Son, H.FI (2004), 'Pro-Poor Growth: Concepts and Measurement with County Case Studies'. International Poverty Centre, Working Paper, No.1, United Nations Development Programme, August.

ICiilu, M. (2010) "Poverty Measurement in Machakos District"  
An Empirical Analysis.  
(Unpublished MA Research Paper, School of Economics, University of Nairobi)

Kimalu, P. Nafula, N. Manda, K. D. Mwabu, G and Kimenyi, S.M (2001), "A Situational Analysis of Poverty in Kenya", Kenya Institute for Public Policy Research and Analysis, (KIPPRA) working Paper No. 6, Nairobi, January.

Mwabu, G. Kiriti, T. Ndenge, G. Kirimi, J. Mariara, J. Gesami, R. Masai, W.. Kimuyu, P. Chemengich, M. and Munene, F. (1999), "Poverty in Kenya Identification\* Measurement and Profiles", Interim Report, University of Nairobi, Ministry of Finance and Ministry of Planning and National Development, Nairobi, April 7.

Ministry of Planning, National Development and Vision 2030  
Kenya National bureau of Statistics,  
*Basic Report of Fourth Participatory Poverty Assessment*  
Nairobi (2007)

Ministry of Planning, National Development and Vision 2030  
Kenya National Bureau of Statistics,  
*Constituency Report on Well Being in Kenya*  
*Based on Kenya Integrated Household Budget Survey*  
Nairobi (2005/2006)

Ministry of Planning, National Development and Vision 2030  
Kenya National Bureau of Statistics,  
*Well Being in Kenya -A Socio-Economic Profile*  
Nairobi (2000)

Ministry of Planning, National Development and Vision 2030  
Kenya National Bureau of Statistics,  
*Welfare Indicators in Rural poor in Kenya Volume III*  
Nairobi (2000)

Ministry of Planning, National Development and Vision 2030  
Kenya National Bureau of Statistics,  
*Basic Report on Well Being in Kenya Rural Districts*  
*Based on Kenya Integrated Household Budget Survey*  
Nairobi (2005/2006)

Nyandemo, S. and Kunwar, D. Singh (2003), *Economics of Development and Planning*

Ravallion, M. and Huppi, M. (1991), "Measuring Changes in Poverty: A Methodological Case Study of Indonesia during an Adjustment Period", *The World Bank Economic Review*, Vol.5 No.1 pp57-82, March.

Ravallion, M. (1992), "Poverty Comparisons: A Guide to Concepts and Methods"  
*Living Standards Measurement Study Working Paper No.88, The World Bank,*  
Washington D.C. February.

Ravallion, M. and Bidani, B. (1993), "How Robust is a Poverty Profile?", *Policy Research Working Paper 1223, Policy Research Department, Poverty and Human Resource Division, The World Bank, November.*

Ravallion, M. (1996), "How Well Can Method Substitute for Data? Five Experiments in Poverty Analysis", *The World Bank Research Observer*, Vol.11, No.2, pp.199-221. August.

Ravallion, M. and Se, B. (1996), "When Methods Matters: Monitoring Poverty in Bangladesh ", *Economic Development and Cultural Change*, Vol. 44 No.4, pp.761-792.

Republic of Kenya (2000a), *Second Report on Poverty in Kenya: Incidence and Depth of Poverty, Volume I*, Central Bureau of Statistics and the Human Resources and Social Services Department, with the assistance of GTZ Social Policy Advisory Services, Ministry of Finance and Planning, Government Printer Nairobi, June.

Republic of Kenya (2007a), *Basic Report on Well-being in Kenya: Based on Kenya Integrated Household Budget Survey 2005/6*, Kenya National Bureau of Statistics, Ministry of Planning and National Development, The Regal Press Kenya Ltd, and Nairobi Kenya.

United States Department of Agriculture, (2004),  
*The Economics of Food, Farming, Natural Resources and Rural America.* Economic  
Research Service

World Bank (2000), *World Development Report 2000/2001: Attacking Poverty*, Washington, D.C World Bank.

IF AD Small Scale Mining and Sustainable Development  
(2007),

**Appendix I: Questionnaire for the stone workers**

**(Stone cutters and loaders)**

**Dear Sir/Madam,**

This questionnaire is scheduled to assess the importance of Small scale stone mining in reducing poverty and improving the livelihoods of the people in Kyasioni Quarry site in Yatta District of Machakos County.

The information is specifically for study purpose and is highly confidential.

Your positive response is highly appreciated.

- (a) Date of the interview
- (b) Respondents number.....•

**A. Demographic information**

**1. Age**

- (a) Less than 18 yrs    Q    (b) 18 - 25 yrs                      (c) 26- 33 yrs    n
- (d) 34 - 41 yrs    Q              (e) 42 - 49 yrs    Q              (f) 50+ yrs

**2. Sex.**

- (a) Male                                      (b) Female                      ●

**3. Level of Education.**

- (a) None    Q              (b) Primary    Q              (c) Secondary    Q              (d) Tertiary    Q

**4. Marital Status.**

- (a) Single    j^J              (b) Married    |\_\_|              (c) Widow    •
- (d) Widower                      (e) Divorced/Separated    |\_\_|

**5. Number of Dependants.**

- (a) None    Q                      (b) 1-5    Q                      (c) 5-10    Q]                      10+

**B. Why People engage in Stone Quarrying.**

6. Why are you engaged in Small scale stone Quarrying

7. For how long have you been engaged in Small scale Stone Quarrying

(a) Less than 6 months | | (b) Less than a year Q

(c) 1 - 5 yrs QJ (d) 5 - 10 yrs

8. Are there any members of your family engaged in Stone Quarrying?

(a) Yes Q (b) No

9. If Yes how many?

Specify (a) Child (b) Spouse Q (c) Relative |

**C. Outcomes from Small scale Stone Mining (Stone Quarrying and Ballast)**

10. How much do you spend per on Basic items and Non-Basic items:-

(a) Day Q : (b) Week Q (c) Month

11. How has the community around Kyasioni Quarry benefited from this activity?

12. What are your other sources of income?

(a) Small scale crop growing

(b) Animal keeping

(c) Remittances from relatives who work elsewhere Q

**13. How has Small scale Stone mining changed your status in terms of?**

(a) Income

(b) Marital Status.....:

(c) Children's education

**14. Do you belong to any Self Help group?**

(a) Yes

(b) No

**15. If YES why did you join**

**16. If NO why**

**17. What kind of housing do you own or live in?**

(a) Temporary

(b) Rented

(b) Semi permanent

(c) Permanent