ASSESSING THE WELFARE INCIDENCE OF PUBLIC SPENDING: A CASE OF KENYA'S RURAL ELECTRIFICATION PROGRAM

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ABSTRACT

Kenya established the rural electrification authority (REA) in 2007. The REA receives an annual budgetary allocation to supplement a 5% levy charged on all electricity bills to subsidize rural connections from the main national grid. Whether or not such justifications for pro-poor public spending are convincing depends on the distribution of the benefits from this spending. Who gains most? Is it the poor? Or does a substantial proportion, even a disproportionate proportion, of the spending go to the economically better-off? These are the questions addressed in this study.

The study analyzes the distributional effects of the program using benefit incidence analysis (BIA). To do the benefit incidence analysis (BIA), the study matches government spending for the 2005/6 financial year on 77 districts sampled by the Kenya integrated household budget survey (2005/60). The distributional impacts of the government subsidy are assessed at two levels; the district and regional (province) level. The findings are that implementation of this policy by providing direct subsidies to all facilities in rural areas was not equitably benefitting all income groups. At the regional level the distribution of benefits was progressive with poorer household deciles benefiting more than the better ones. However, at the district level, the allocation of government subsidy on REP was slightly regressive as a disproportionate proportion, of the spending accrued to the economically better-off. Given the district level may be a more accurate level of assessing access; the program me may therefore not have been very effective in achieving its intended objective since the subsidy is captured more by the better off households.

The study recommends that policy makers need to re-think the program strategy with a view to focusing on equity as a strategic policy goal and improve on beneficiary targeting

Key words- *Beneficiary targeting, incidence, government subsidy, distributive policy*

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ACRONYMS

RE:	Rural Electrification
ERC:	Energy Regulatory Commission
REA:	Rural Electrification Authority
REP:	Rural Electrification Program
GDP:	Gross Domestic Product
REFs:	Rural Electrification Funds
NGO:	Non -Governmental Organization
UNDP;	United Nations development program
KNBS;	Kenya National Bureau of Statistics
KIHBS;	Kenya Integrated Household Budget Survey
NASSEP;	National sample Survey and Evaluation Program

1. INTRODUCTION

1.1 Background

Electrification has been found to result in direct economic benefits in places where infrastructure such as roads, water supply systems and social services are available in rural areas. Lack of access to electricity affects mostly rural areas of developing countries leading to missed opportunities for development (UNDP, 2000).

This realization led to the power sector reforms which focus on increasing the access and affordability of electricity by all people that need the service.. (Wamukonya2003).

Recognizing that electricity is a key driver for rapid economic growth and poverty alleviation, Kenya set itself the target of providing access to electricity to all households by the year 2030. The Census 2009 revealed that about 55% of the households in Kenya did not have access to electricity. This was only a 10% improvement on the 1999 census that had indicated a 45% access. Hence, meeting the target of providing universal access in the next 20 years seems like a daunting task requiring significant addition to generation capacity and expansion of the transmission and distribution network.

The demand for power has continued to outstrip the growth of its availability in Kenya. In 2010 for instance, the access to electricity in rural areas grew by 6.0% while demand by rural consumers grew by 37.7% (Economic survey 2011, KNBS). Substantial peak and energy shortages are also frequent. This is due to inadequacies in generation, transmission and distribution as well as inefficient use of electricity (Abdallah,S M 2008). According to Abdallah (2008), very high level of technical and commercial losses and lack of commercial approach in management of utilities has led to unsustainable financial operations with cross-subsidies rising to unsustainable levels.

The National Electrification Policy has evolved to accommodate the interests of the rural consumers through introduction of the Rural Electrification Authority (REA). Kenya embarked on power sector reforms in 1973 when a policy on Rural Electrification Program (REP) was formulated. By the

year 2003, only 4% of connectivity had been achieved (Compare with 35-40% in other comparable countries like Chile over the same period). At that time, the cumulative government spending on rural electrification program stood at Ksh 7.84 billion. In 2006, parliament enacted the Energy Act with a subsequent creation of the Rural Electrification Authority (REA) on September, 31st 2007. REA's main object was to provide quality and affordable electricity to all in the rural areas. The strategy was to accelerate the pace of rural electrification, increase affordability and expand accessibility of electricity. To achieve this, Section 79 of the Energy Act (2006), established the Rural Electrification Fund (REF) whereby Kenya Power, a semi-autonomous agency responsible for power distribution, was required to charge 5% on all electricity bills. This levy was to be managed by the REA whose role was to develop a master plan for REP, do resource mobilization, promote renewable energy and manage the rural electrification systems such as licensing and tendering for power connection and other procurement activities.

1.2 The Research Problem

The goal for REA was to electrify 1 million households by year 2012 and attain 100% connectivity by 2030.

By 2012, 38 years after formulation of the REP, having spent a cumulative Ksh 45.1billion on capital expenditure, rural electricity connection stood at 26% only. That is, 261,000 rural connections against the target of one million (KNBS, 2013). There is therefore a mismatch between the outcome and the amount of resources spent since inception of REP (1973).

This study analyzes the distributional effects of government spending on rural electrification as a policy and seeks to assess whether the public spending is pro-poor. Whether or not justifications for pro-poor public spending are convincing depends on the distribution of the benefits from this spending. Who gains most? Is it the poor? Or does a substantial proportion, even a disproportionate proportion, of the spending go to the economically better-off? These are the key concerns addressed in this study.

The key questions that guide this study are:

1. To what extent has the poor benefited from public expenditure under the REP?
2. Does the level of assessment of the distributional impacts matter? That is, what is the benefit incidence of the Rural Electrification program expenditure at regional and district levels?

1.3 Objectives

The purpose of this study was to access the distributional impact of the Rural Electrification program and assess the extent to which the program has targeted the intended poor rural households.

The specific objectives were to;

1, Establish the REP beneficiaries aggregated by their socio-economic groups and

2, Assess the pro-poorness of the REP expenditure at each level of allocation- Regional (Provincial) and District.

1.4 Justification

The pro-poorness of public spending need to be justified by the distribution of the benefits to the target population. Questions such as who gains most from such spending need clear answers. There is paucity of such knowledge for the case of the REP in Kenya. Studies on the effectiveness of the REP in terms of its distributional impacts to the intended rural households are still lacking. The study is useful in

that it provides evidence on effectiveness of public spending and the methodology used is applicable to assessment of other targeted programmes.

1.5 Scope

This study focuses on distribution of rural electricity across the 77 administrative districts in Kenya. The specific unit of observation is the households that are targeted by the rural electrification program and the unit of analysis is the in-group variations in the share of government spending (Electrification subsidy) among population groups of different income levels.

1.6 Limitations

This study concerns itself with the average benefit incidence. The scenario could change if we looked at the marginal effects of additional subsidies over the years. Another limitation is that the period for which government spending was observed under this study (2005/6) happens to be a transition year after which the rural electrification authority took over management of the program. At the same time, the household budget data is quite dated, as it is now 8 years old. An updated study would show the current status and whether the change of management of REP may have improved the effectiveness of the policy.

2. LITERATURE REVIEW

An understanding of key challenges and issues in providing electricity in rural areas is necessary for us to clearly appreciate the supply chain, agents of the supply and the current institutional arrangements. This chapter presents a theoretical review of these issues to obtain a background view of the variables that will be used in the study

2.1 Key Players

The players in Kenya's rural electrification program are ministry of energy which is responsible for budgetary allocation, other forms of financing and monitoring, the Rural Electrification Authority which is responsible for the program implementation including planning, selection of fundable connections, awarding contracts and certifying projects completion. The Kenya power (A semi-sate agency) is responsible for the supply-providing electricity to those who apply for connection as service users. They take a commercial path to deal with beneficiaries as customers who can pay their bills after REA has brought the transformers close to them. Kenya Power has a separate rural electrification unit for receiving and processing such applications as well as ensuring that billing is done at the rate designated for the REP.

2.2 Costing And Mechanisms for Financing Rural Electrification Programs

We can learn from the arguments of Cornes (1995) whose discussions clarified some issues regarding the nature of government subsidies in electrification and their measurement.

Cornes argues that private sector players are likely to participate in the REF when they see that sustainable rural energy markets are likely to emerge and that the government policy supports such markets, the people can have a voice in the REF's decision-making and management process, a reasonable potential for profit exists, the REF is run along commercial lines and is far from direct political interference, and local rural communities are likely to increase their participation in the RE activity and May eventually be willing to participate with larger degree of cost-sharing when they are assured of reasonable voice in the REF administration. This entails wider consultation during REF establishment

phase with rural communities for their possible participation in the management of REF. Such an arrangement is likely to result in larger number of rural households electrified in the most cost effective manner.

2.3 Incentives and Forms of Grants

Rural electrification subsidies take several forms which according to Ranganathan (1992) include targeted subsidies, incentives to the private sector and recovery of cost of service.

Targeted subsidies:

Where resources are limited, selective targeting of subsidies is always preferable. By and large, the people who cannot afford to have electricity connections are the poor and indigenous communities. The subsidy based on the average cost of connections while administratively expeditious, will provide subsidy across the board for all connections. Targeting subsidies to specific groups or geographic locations, on the other hand, may complicate administration and planning. Initially, the Government may try to target subsidies by specifying a list of target communities and the expected number of connections in each community to benefit under a particular RE project. Linking payment of the subsidy to certain performance criteria would afford objective verification of achievement or lack of it. At the same time it would also greatly increase the complexity and burden of monitoring.

Incentives to the Private Sector:

Incentives available to the private energy providers should be clearly articulated and well publicized. In addition, penalties for failing to complete the program should be included in all contracts awarded under the fund. For example, larger and more attractive subsidies may be provided to those providers who agree to connect more distant communities and those from the poorer sections of the rural population.

Recovery of Cost of Service:

While the regulator should ensure adequate level of competition for financing through the REF, it should at the same time ensure that the service providers are able to recover the costs and some reasonable amount of profit/surplus.

In summary, the most desirable situation is when subsides are for financing capital investment, targeted to those most in need, transparent and granted through competition among energy service providers, and lastly measurable in terms performance targets

2.4 Institutional Implementation of REFs

According to Ranganathan (1992), REFs are generally funded out of tax payers' money, and are leveraged with funds from other sources. He identified the following as important issues that need to be taken in to consideration when designing REF management policies and operation practices:

Firstly, REFs need to be adequately regulated according to the legal and regulatory environment of each country.

Secondly, government agencies in charge of energy matters need to take full responsibility for implementation and supervision

Lastly, the REF Management Board should be well represented by all stakeholders to allow effective evaluation

Rules and procedures for the management and administration of the REFs should be based on accepted international best practices. To achieve this, the government must seek effective stakeholder participation .Another perspective is highlighted by Karikezi and Kimani (2002). They pointed out that it is generally advisable to keep the operational management of the fund outside of public administration. This is also necessary to ensure that commercial practices are included in REF operations. A poorly designed REF may result in low or no capitalization by donors and private sector, with little impact on the rural level electrification.

2.5 Issues in Pricing

Price, in standard micro-economic theory, is usually taken as a good guide for measuring utility. But that is not the case with pure public goods, and private goods which are provided by the state. This may be emphasized no better than from the following caption;

"Sometimes no price is charged, but this does not mean that the service is not valued. Even when prices are charged, the provision of the service is often rationed, so that the price paid does not necessarily reflect its value to the consumer. Yet in deciding which services to provide, and to get some idea of which groups in society benefit, some measure (monetary) of the distribution of the benefits derived from publicly provided services are called for"(Van de Wale, 1998).

Other contemporary arguments like those from Aaron and McGuire (2005 have it that a rationed publicly-provided good or service should be evaluated at the individual's own valuation of the good (his or her demand- or virtual-price).

But new approaches emerged as a way of dealing with the difficulties inherent in estimating these valuations (reviewed by Cornes, 1995). Firstly, publicly-provided goods and services are valued at their marginal cost- the behavioral method (van de Wale (1998).

Secondly, the benefit incidence analysis, which combines the cost of providing public services with information on their use or accessibility in order to generate distributional patterns of the benefit of government spending. One cardinal mandate of a government is to provide public goods to its citizens who expect the fairness in the distribution of the same. Unfortunately, many times this is never the case thus necessitating frequent evaluations to justify their existence.

2.6 Benefit Incidence as A Measure of Inequality

Recent years have been characterized by a significant effort in terms of research aimed at understanding poverty as a phenomenon and its reduction (Kabore.T.S2008). Over the years, many countries in Africa have developed Poverty Reduction Strategy Papers (PRSP) as road maps toward poverty reduction. In the central position as apriority among many development partners, researchers and decision makers is the strategies and methods of dealing with poverty, economic growth and income distribution. Of even greater interest is the ways poverty gains root, the ways of decomposing it in to growth and also its redistribution to mitigate inequality.

One of the methods commonly used for decomposing inequality is the Benefit Incidence Analysis (BIA). The BIA approach was pioneered by twin World Bank studies Conducted by Meerman (1979) for Malaysia and Selowsky (1979) for Colombia .Benefit incidence tells us who is benefiting from public services, and describes the welfare impact of government spending on different groups of people or individual households.

It does this by matching information about the use of services (usually obtained from the households themselves through a sample survey) with the unit costs of providing those services (obtained usually from government or service-provider data). In effect, the analysis imputes a benefit to those households using a particular service to the cost of providing that service. This imputed benefit to an individual household is the amount of income by which that household would have to raise if it had to pay for the service used; and this is the incidence of the government subsidy.

2.7 Critique of Existing Literature

Generally, analyzing benefit incidence by income or expenditure population deciles means that the survey from which we obtain information on service use must also gather the data needed to calculate the welfare measure. Often surveys which collect the latter (e.g. budget surveys) do not obtain information on service use. And surveys which are designed to get data on service use do not get information on the income or expenditure of the service users.

2.8 Research Gaps

Although literature reveals substantial work regarding costing and pricing, no study in Kenya has focused on distributive aspects of the rural electrification policy. A distributive policy is one which grants some sort of benefits to a particular interest group or other well-defined, relatively smaller group of beneficiaries (Birkland, 2011). In such a policy, a resource is taken from a broad group of people like all consumers to a narrower group like the rural poor. This is referred to as beneficiary targeting. The effectiveness of such targeting has not been explored for the Kenya's REP

2.9 Conceptual Framework

The main variables of this study are progressiveness and beneficiary targeting in distribution of government subsidies. A common objective for all targeting mechanisms is to correctly identify which households or individuals are poor and which are not. Targeting as a tool is used to select prospective beneficiaries of any government intervention. In principle, it should concentrate on the benefits of social assistance programs to the poorest segments of the population. Targeting is a means of increasing the benefits that the poor can get with a fixed public program budget through increased efficiency (Coady et al, 2004).

The progressivity of public spending can be assessed by comparing the benefit concentration curve derived from the cumulative distribution of benefits against the proportion of household receiving the cumulative share of the benefits (the Lorenz curve) with the 45 degree diagonal line representing the equal distribution of benefits. .

If the distribution of benefits lies along the 45 degree diagonal line, the poorest 10percent of the population gets 10 percent of the spending; poorest 20 percent account for 20 percent of the expenditure; and so on. Thus, the diagonal reflects perfect equality in the distribution of benefits and it is also referred to as perfect equality (PE) line. The distribution of benefits is said to be progressive if the lower income groups receive a larger share of the benefits from government spending than the richer income groups.

2.10 Theoretical Framework

Theoretical frame works are used by social scientists to explain and analyze how social, structures, functions and processes interact. This investigation is based on the affirmative action theory, the public choice theory and the Principal-agent theory of public management to understand the relational issues about equitable distribution of public resources.

Affirmative Action Theory

When subsidies on services and goods are targeted to the poor, the neighboring richer populations could end up consuming them at a price below their ability to pay, implying a free rider problem. Richard Musgrave (1956) argued that often, free rider problems necessarily require a political solution. The affirmative action theory has a liberation case as the foundation and advocates for equal distribution of benefits are based to a great extent, on group membership. Affirmative action is a policy that ensures opportunity to all individuals and is a powerful reminder to all in authority to analyze whether they are guilty of practicing conscious or unconscious discrimination. The theory has a place today in redressing the social and economic inequality in the country given the high inequalities in income and access to amenities.

The Public Choice Theory

This theory shows the hidden relationship between the three arms of public governance namely the executive, the legislature and the Judiciary. The relationship is one of an alliance to convert the public choice into a private choice where players in the public work tend to share common interest in rent seeking behavior. The political aspect of this theory is the assertion that 'the represented" is never heard because the representative is self-interested in the distribution and utilization of public resources. It explains why most public services either never reach the intended public or they do so very much later than expected. This theory can explain inequalities in the distribution of public resources in favor of politicians or political gate keepers.

The Principal-agent theory of public management

Advocated by the likes of Khalid and Lawarree (2003), this theory demonstrates a relationship between the powerful principal, like say the ministry of Energy and the controlled agent, say, the Rural Electrification Authority. The theory highlights hidden actions of the principal who seeks to capture some rent at the expense of the agent. This happens due to the fact that the principal has informational advantage particularly concerning external conditions. This information asymmetry accounts for poor governance and therefore, underperformance. This could also account for justification that a government agency can go for higher concentration of public goods among the better-to-do populations based on market markers when actually the service is a pure public good.

3. METHODOLOGY

This chapter presents the methods used in the study. It highlights the scope, sources of data t and finally the analytical techniques used.

3.1 Scope of The Study

The study covered all the seven administrative provinces in Kenya and followed the government subsidy to the seventy seven districts throughout the country.

3.2 Data

The study used data from the Kenya Integrated Household Budget Survey (KIHBS) of 2005/6. The survey was organized in such a way that a total of 13,430 households were randomly selected to comprise the KIHBS sample, which was designed to generate representative statistics at the national,

provincial and district levels. The sampling design involved a number of stages and challenges, which are elaborated in this section.

A representative sample of 13,430 households was drawn from 1,343 clusters stratified by district in both urban and rural areas. 10 households were randomly selected from each cluster. The total sample sizes in rural and urban areas were 8,610 and 4,820 households respectively.

The 1,343 KIHBS clusters were the Primary Sampling Units (PSUs) from the NASSEP IV sampling frame, which is designed to give nationally, and sub-nationally, representative household survey samples. The NASSEP IV sampling frame is composed of 1,800 clusters selected with probability proportional to size from a set of all Enumeration Areas (EA) used during the 1999 Population and Housing Census.

3.3 Data Analysis

Benefit incidence tells us who is benefiting from public services, and describes the welfare impact of government spending on different groups of people or individual households.

As is the practice, estimating the benefit incidence of public spending on rural electrification therefore involved three steps as follows;

1. Knowing the users:

Information on households that use the service was obtained from the Kenya Integrated household budget survey 2005/6. The users were appropriately identified from the list of facilities with electricity connections by districts and province as provided by the Kenya power company.

2. Estimating the unit cost of subsidies:

The unit cost of providing electricity was defined as the total government budgetary allocation from the ministry of Energy on for the fiscal year 2005/6 divided by the total number of public facilities connected to the national grid system for the same period. This was done at two levels namely the district and the province (region).

The total government budgetary allocation for year 2006 was Ksh 834Million.

This was divided by 212 facilities the Kenya Power electrified in the year to arrive at Ksh 3,933,962 per unit. This cost of facility installation was allocated across the various population deciles that live in the districts that received the subsidy.

3. Combining users in to groups.

To describe how the benefits from public spending were distributed across the population, it was helpful to combine or aggregate individuals or households into homogenous groups. We used income based homogeneous groupings of households who have access to a unit of good or service. The well-being report by KNIBS (2011) shows levels of absolute poverty for each district. The KIHBS 2005/6 provides data on households grouped in terms of their expenditure budget levels. These poverty levels were placed on a continuum with 10 deciles 1, 2, 3, 4 to 10 where 1 is the poorest group.

4. Deriving the distribution of benefits

This was done by multiplying the average benefit derived from the previous step by the number of users of the service in each income or consumption group.

Using the model that follows below, the benefit incidence of total electrification spending (**Xb**) imputed to decile 1 would be these decile's estimated share of expenditure subsidy ($\mathbf{e_i}$) times the unit cost of one installation ($\mathbf{s_h/e_h}$) times the total number of installations in the district or province (N). The same procedure follows for deciles2 to 10. ($\mathbf{s_h/e_h}$) is the mean unit cost of connecting to one facility/subsidy extended to rural beneficiaries while ($\mathbf{s_i}$) represents the total government spending on rural electrification in the fiscal year 2005/6.

The share of total electrification spending imputed to all beneficiaries in the fiscal year 2005/6 was formally captured from three notations namely h, j, at the district level and later modified to capture regional variations by including k in the equation. These scripts are indices for 77districts which received the installations, at household deciles1 to 10. This model can be written firstly for district level distribution and secondly for region level distribution. The district level variations equation was arrived at as follows;

$$Xb= \sum_{h=1}^{77} \sum_{j=1}^{10}{}' \; e_{hj} \cdot (s_k/e_h)$$

The second equation is modified to accommodate the 7 regional/provincial variations k such that the overall incidence ($\mathbf{X_{bv}}$) equals a)$\mathbf{e_{hjk}}$ being the Share of group/decile in total benefit in the region it belongs to and b) $\mathbf{s_{hjk}}$ being the Share of group/decile in total spending in their region, to produce the model below;

$$Xbv= \sum_{h=1}^{77} \sum_{j=1}^{10} \sum_{k=1}^{7}{}' \; e_{hjk} \cdot s_{hjk}$$

In order to understand the full district based incidence, gini coefficients were calculated for all districts where connections were made. A Gini coefficient (Gc) was calculated using the formula according to Brown (1994)

$$Gc= 1 - \sum_{i-0.}^{n-1} (X_{i+1}-X_i)\,(Y_{i+1+}Y_i).$$

When the gini coefficient=0, this implies a complete equality and when Gc=1 there exists a complete inequality.

4. RESULTS AND DISCUSSIONS

This chapter presents the data obtained, how it was analyzed, the outcomes and discussions. It starts by providing a summary description of the data used in the study and followed by the results of the distributional impact analysis.

4.1 Beneficiaries of Rural Electrification Funding

This section deals with presentation of data on the economic classification of population groups of beneficiary households in the districts where REF were spent. There were 212 public electrifications in the year out of which 8 were Mombasa and Nairobi, areas not considered to be targeted for REP. The table below shows the districts and regions in which electricity was connected to public facilities such as schools and health centers in rural areas. The number of facilities is inserted in brackets.

Table1 List of Public connections to Rural electricity 2005/6-Per province

Region	Total facilities connected in all districts	Highest recipient		Lowest recipient	
		District	connections	District	connections
Central	84	Nyeri	(35)	Kirinyaga	(3)
Coast	20	Kwale	(15)	Taveta	(0)
Eastern	36	Meru. s	(12)	Isiolo	(0)
N. Eastern	0		0		0
Nyanza	25	Nyamira	(5)	Bondo	(0)
R/valley	32	Nakuru	(10)	Marakwet	(0)
Western	7	Kakamega	(2)	Teso	(0)
Total connections	**204**				

This allocation was further broken down to districts as shown in table 2 in the Appendices (Appendix 11-page 50)

It may be noted that the district based list includes both Nairobi and Mombasa. These two towns do not fall under "Rural" in the REP strategy,

4.2 Incidence of Distribution- Rural Electrification Funding

This section assesses the distributive effects of the rural electrification funding. It presents data on all government expenditure on REP since inception to demonstrate that year 2005/6 was not far from the average annual spending. It also presents data on rural poor populations in 10 deciles of their expenditure patterns. Each district has a specific share of expenditure index and the same is distributed across the 10 deciles. These share indices are multiplied with the unit cost of subsidy to derive concentration graphs that follow. The calculation and observations are made for both the regional (Table 3 and 4 and Figures 1 and 2) and Table 5 and Figure 2 for district levels of distribution.

Table 2: Trend of annual budgetary allocation for REP1973-2012

Fiscal year	Ksh in Mil
1973-1999	**5000**
1999/0	**708**
2000/1	**952**
2001/2	**889**
2002/3	**765**
2003/4	**598**
2004/5	**670**
2005/6	**834**
2006/7	**4339**
2007/8	**5900**
2008/9	**4745**
2009/10	**4800**
Total	**30,200**

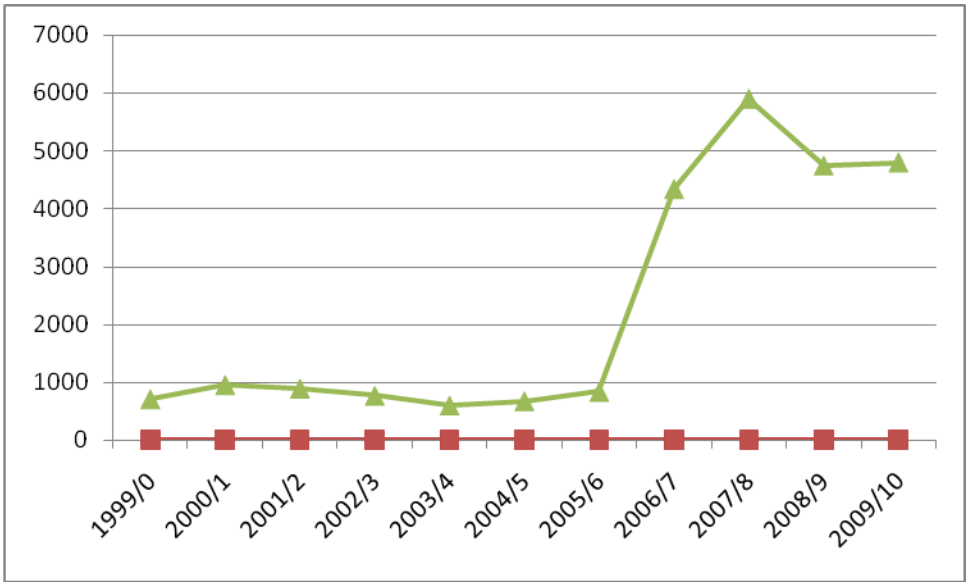

Figure 1: Movement of annual budgetary allocation for REP

Table 3 and Figure 1 provide information about the magnitude of government budgetary allocations to the rural electrification program over the years since inception.

Table 3 Regional expenditure distribution by h/hold deciles – Rural 2005/6

Region/province	Connections	Household expenditure deciles/groups									
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Central	84	6.4	10.4	17	24.9	34.9	41.2	57.4	69.7	84	100
coast	20	15.6	29.6	44	56.9	69.1	73.1	85.3	90.7	96.2	100
Eastern	36	15.7	25.2	36	47.8	59.6	62.6	76.4	86	93.5	100
North Easter	0	24.1	45.1	62	70.2	77.6	81.0	87.5	92	97.8	100
Nyanza	25	8.6	19.8	31	42.2	53.6	58.1	73.6	83.9	93.4	100
Rift Valley	32	11.5	21.1	32	43.1	55	59.1	72.9	83.4	91.7	100
Western	7	9.3	22.4	35	46.8	58.8	61.8	78.5	88.6	95.1	100
Overall	**204**	**13.0**	**24.8**	**36.7**	**47.4**	**57.6**	**67.2**	**75.9**	**84.9**	**93.1**	**100**

The totals above were added up and analyzed to make cumulative frequency table 5 below;

Table 4: Regional expenditure distribution by h/hold deciles – Rural 2005/6

Household expenditure deciles	Average expenditure	Unit cost of subsidy	% distribution of subsidy	Cumulative % distribution of subsidy
1	479.3	3.9	13.0	**13.0**
2	818.8	3.9	11.8	**24.8**
3	1047.1	3.9	11.9	**36.7**
4	1257.1	3.9	10.7	**47.4**
5	1471.8	3.9	10.2	**57.6**
6	1741.8	3.9	9.6	**67.2**
7	2058.8	3.9	8.7	**75.9**
8	2508.9	3.9	8.9	**84.9**
9	3185.4	3.9	8.2	**93.1**
10	5858.1	3.9	6.9	**100**

The unit cost –Ksh3,933,962.00 i.e. ($\mathbf{s_h/e_h}$) was multiplied with the number of public connections (**e**) in the district (**i**) for all the 10 deciles of beneficiaries (j) therefore (e_{ij}) and further multiplied by the

expenditure share of a particular province (**k**) such that the overall incidence equals a) The share of group in total benefit in the region it belongs to $\mathbf{e_{hjk}}$ and b) The share of group in total spending in their region $\mathbf{s_{hjk}}$ all summarized in the model below;

$$Xbv = \sum_{h=1}^{77} \sum_{j=1}^{10} \sum_{k=1}^{7} e_{hjk} \cdot s_{hjk}$$

Each share of a decile ($\mathbf{X_h}$) was expressed as a percentage of the grand total ($\mathbf{X_{bv}}$) so that a cumulative distribution table could be produced in Fig 3 below.

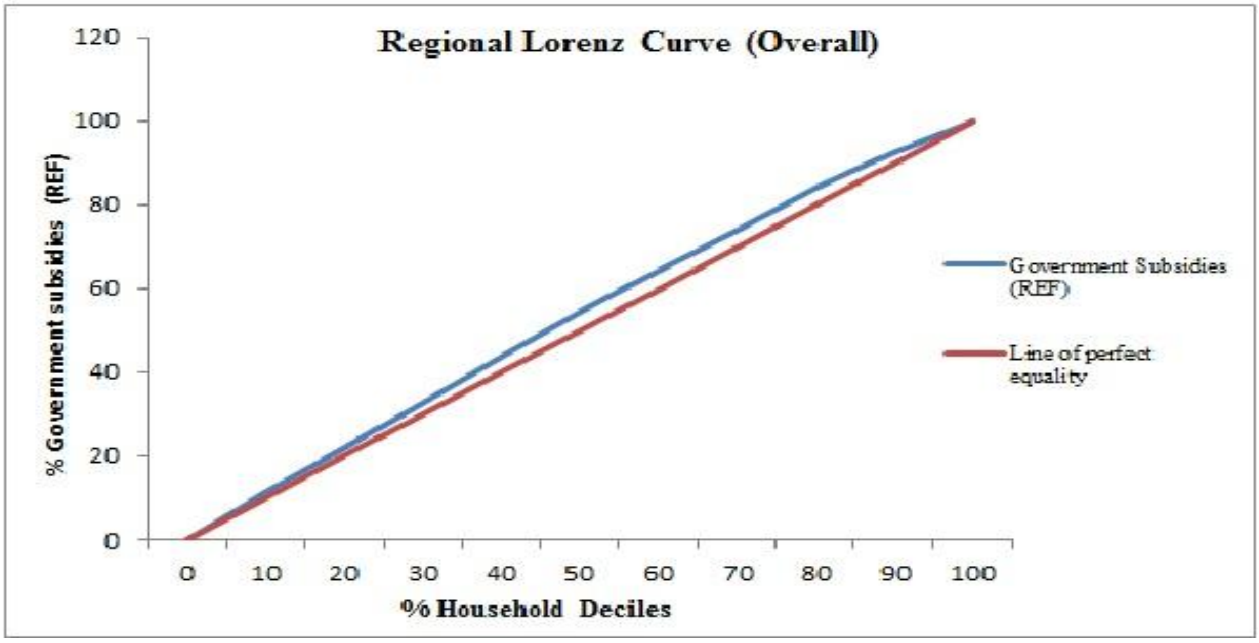

Figure2.Distributions by household deciles – Rural 2005/6 (Region Based)

The graph matches 2 data sets of cumulative % distribution (Y) against that of % of household cumulative share expenditure. The diagonal line is drawn at 45 degrees and represents perfect equality. The distribution lines form a pattern around the perfect equality and since starting and end points are the same (it is a cumulative frequency curve) the area between the interceptions forms the Lorenz curve.

When the Lorenz curve lies above the perfect equality as it does in the graph above, the impression is that the distribution of government subsidy on rural electrification is slightly progressive with poor groups of beneficiaries taking a bigger share than the richer groups. At this level the benefit incidence may appear progressive but the impression may have arisen out of firstly, the fact that provinces are heterogeneous in nature;

Secondly, the problem of averages which may hide specific distributional variations at district and county levels and thirdly, the implementing agency – REA has a direct control over allocation of funds at this level.

However, at the lower levels particularly the district, the variations were slightly different if we consider the Table 6 in the appendices as well as the second lot of variations re-arranged into a cumulative distribution table below;

Table 5: Expenditure distribution by H/holds - Rural 2005/6 (District based)

Deciles	Average Expenditure	Average unit cost of subsidy(millions)	% Distribution of subsidy	Cumulative % Distribution
1	479.3	3.9	8.4	**8.4**
2	818.8	3.9	8.4	**16.8**
3	1047.1	3.9	16.9	**26.7**
4	1257.1	3.9	9.5	**36.2**
5	1471.8	3.9	10.4	**46.7**
6	1741.8	3.9	10.5	**57.2**
7	2058.8	3.9	10.4	**67.6**
8	2508.9	3.9	11.0	**78.6**
9	3185.4	3.9	11.3	**89.9**
10	5858	3.9	10.3	**100**

At this level, the unit cost (s_h/e_h) was multiplied with the number of public connections (e) in the district (h) for all the 10 deciles of beneficiaries (j) therefore (e_{hj}) to arrive at the total share of subsidy Xi ,using formula

$$Xb = \sum_{h=1}^{77} \sum_{j=1}^{10} e_{hj} \cdot (s_h/e_h)$$

Each share per decile (X_h) was expressed as a percentage of the grand total (X_b) so that a cumulative distribution table could be produced.

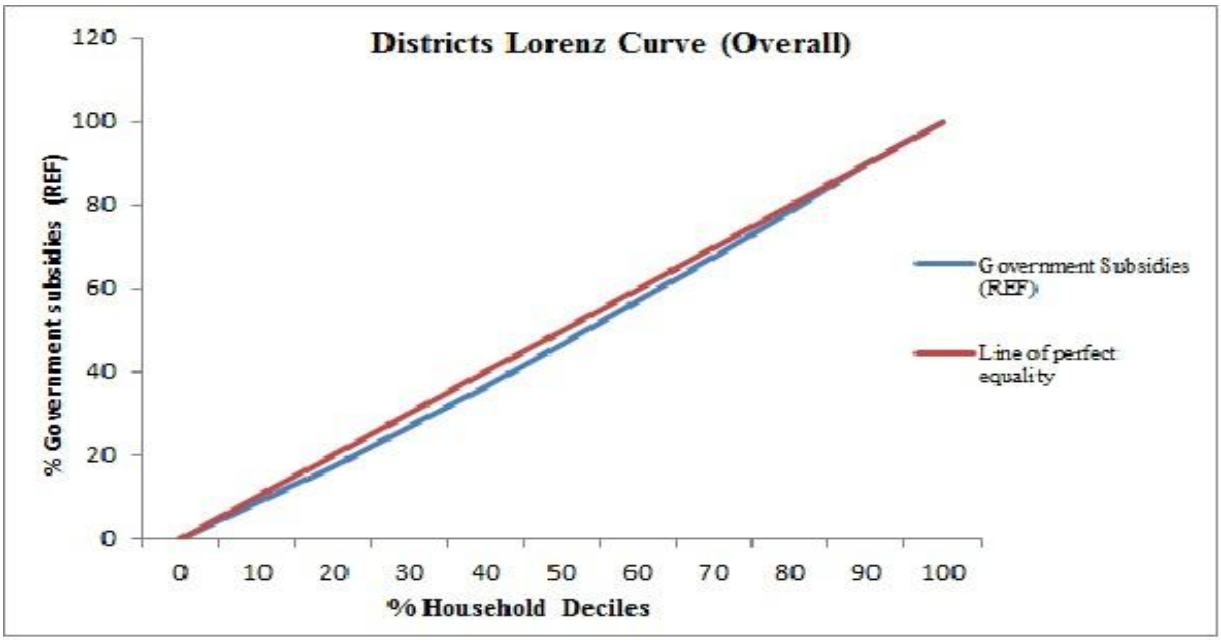

Figure 3: Expenditure distribution by households – Rural 2005/6 (district based).

The graph displays a Lorenz curve running below the perfect equality line implying that most of the benefit distribution was slightly regressive. The benefit from rural electrification (Government subsidy) therefore occurred at the richer population groups.

The poorer population groups got a smaller share of the benefit than their richer counterparts. The information in the annexed table 7 is analyzed in a table 8 below for a clearer observation of the district level variations.

1.	Near complete	0.01-0.30	Thika, Meru central	29
2.	Mild equality	0.30-0.50	Muranga ,Kiambu	25.5
3.	Mild inequality	0.50-0.80	Kajiado, Nakuru, Nyeri, Maragua, Machakos, Kwale, Kirinyaga,Nyandarua	39.62
4.	Moderate inequality	0.80-0.99	Makueni, Siaya, Nyamira, Laikipia, Kisii, Embu, Migori, Nyando, Baringo, Kericho, Narok, Butere/Mumias, Lamu, Kisumu, Koibatek, Nandi, Buret, Mbeere, Keiyo, Tranzoia, West Pokot, Lugari, Kilifi, Rachuonyo, Kakamega, Vihiga, Kitui, Suba, Busia	48.9
5.	Very high inequality	1	Mombasa, Tana River, TaitaTaveta, Malindi, Marsabit, Moyale, Garissa, Mandera, Wajir, Isiolo, Meru South, Gucha,Homabay, Kuria, Bondo, Bomet, Marakwet,Samburu, Transmara, Turkana, UasinGichu, Bungoma, Mt. Elgon, Teso	60.58

Table 6: Gini Coefficients for districts- REP 2005/6

Although the subsidy on average benefited the targeted population, this specific analysis reveals a variation among households of different income/expenditure levels. This is further explained from the distribution table of Gini coefficients (Table 7) for all the districts as a breakdown of the observed inequalities (Appendix 111-page 51).

Below is a graphical representation of how these inequalities clustered around the line of perfect equality.

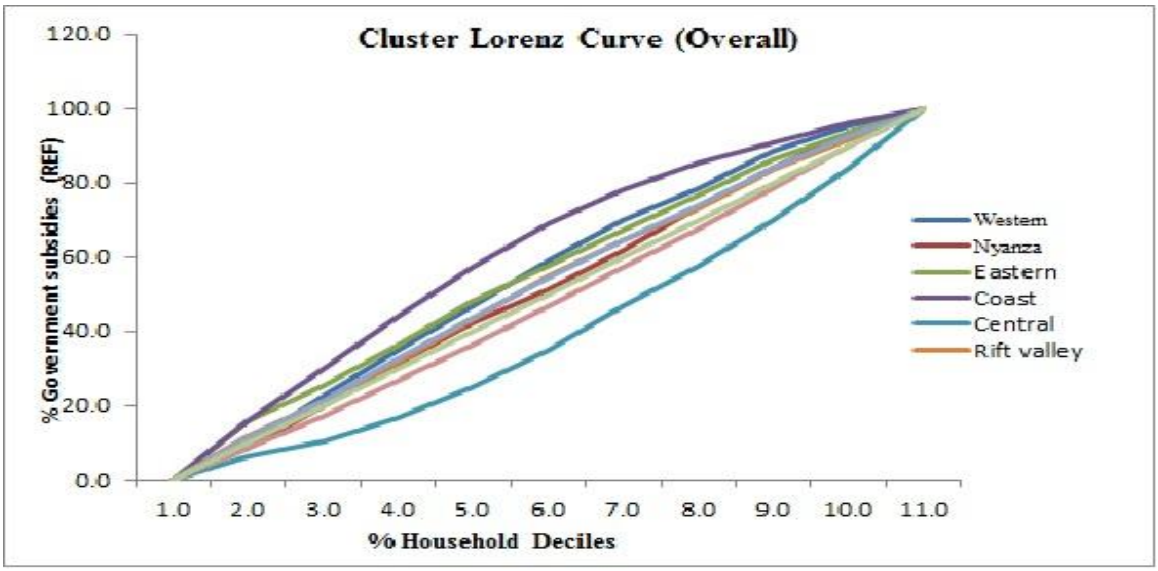

Figure 4: Lorenz graph for all districts- REP benefit distribution- 2005/6.

The specific Lorenz curves for the districts were drawn and are appended as figures 4.5 to 4.10. At this level the benefit accrued more at the better off households.

Given that the district level may be a more accurate level of assessing access, the program may therefore not have been very effective in achieving its intended objective since the subsidy is captured more by the better off households.

Findings from this study are similar to previous ones and in particular that of Demery.L and Dayton, (1994) in their study on the Incidence of public spending in Kenya. The distribution of the subsidy among expenditure groups was relatively unequal, with individuals in the higher expenditure deciles receiving significantly larger subsides than those the lower deciles. The top rural decile received an average of Kshs. 152 per capita as compared with just KShs. 75 for the bottom decile. In their study, the allocation of public health expenditure subsidies generally increased with higher order of deciles. The estimate of the overall subsidy was marginally higher (at KShs 101 per capita). The top decile received on average KShs 134 per capita per year compared with just KShs 66 for the lowest decile.

It is common practice in public management to trade off a certain policy goal with another. A government agency may choose to prefer efficiency to equity particularly in the formative years of a program. If electricity is made accessible to the poor groups, the uptake might be slow due to price constraints when individual households apply for connection. The subsidized base application fees stood at Kshs 35,000.00 for a single phase meter. This was not affordable to every household yet REA needed to recover other costs through sale of Kilowatts. With such a rationale, equity is compromised.

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents a summary of all the findings and discussions of the study. It also presents the study conclusion policy recommendations and areas of further research.

5.1 Summary

The study sought to access whether government funds in the Rural Electrification program were equitably distributed across different income/expenditure groups or/and if spending is in reality targeted to the poor rural households.

The study aimed at answering the questions; to what extent has the poor benefited from public expenditure under the Rural Electrification program? And does the level of assessment of the distributional impacts matter? That is, what is the benefit incidence of the Rural Electrification program expenditure at regional and district levels? The objectives of the study were 1) To establish the REP beneficiaries by their socio-economic groups, and 2) To assess the pro-poorness of the rural electrification implementation in Kenya as regards resource distribution.

The study used secondary data from the Kenya integrated household budget survey 2005/6 from sampled 77 districts. The study utilized the Benefit Incidence Analysis. The study matched two data sets, namely; the government spending (2005/6) under the REP against 77 sampled districts, and populations classified in 10 deciles based on household expenditure. The analysis focused on distributional variation of government subsidy at two levels namely the district and region (province). The variations were observed to be mild with a difference of 2.9% between the smallest and highest group of beneficiaries (translates to Ksh 113,180.00).

The findings are that implementation of this policy by providing direct subsidies to all facilities in rural areas were not equitably benefitting all income groups. At the regional level the distribution of benefits was progressive with poorer household deciles benefiting more than the better ones. However, at the district level, the allocation of government subsidy on REP was slightly regressive as a disproportionate proportion, of the spending accrued to the economically better-off. Given the district level may be a more accurate level of assessing access; the programme may therefore not have been very effective in achieving its intended objective since the subsidy is captured more by the better off households.

5.2 Recommendations

The government of Kenya has aimed to ensure equitable access to quality energy services by implementing a "subsidized rural electricity for all" policy since 2007, hoping that utilization of services would henceforth be based on need, not on individuals' ability to pay. The results of this study, however, have established that implementation of this policy by providing direct subsidies to all rural areas facilities was not equitably benefitting all income groups. In fact, higher government subsidies on rural electricity connections are skewed towards the wealthier group more than poorer groups when assessed at the district level.

Policy makers need to re-think the program strategy with a view to focusing on equity as a strategic policy goal and improve on beneficiary targeting. Beneficiary targeting is a means of expanding the efficiency of the program by increasing the benefits that the poor can get with a fixed program budget (Coady, et al, 2004). The rural electrification authority is not clear about the definition of 'rural'. Only Nairobi (which received 2 connections in the fiscal years under study), Mombasa and parts of Nakuru are

excluded from the meaning of rural. Everywhere else is regarded as being rural. In terms of policy perspectives, this definition is very important in beneficiary targeting.

5.3 Further Area of Study

The period for which government spending was observed (2005/6) under this study happens to be a transition year after which the rural electrification authority took over management of the program. At the same time, the household budget data is quite dated, as it is now 8 years old. An updated study would show the current status and whether the change of management of REP may have improved the policy effectiveness.

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APPENDICES

APPENDIX I: Tables and figures

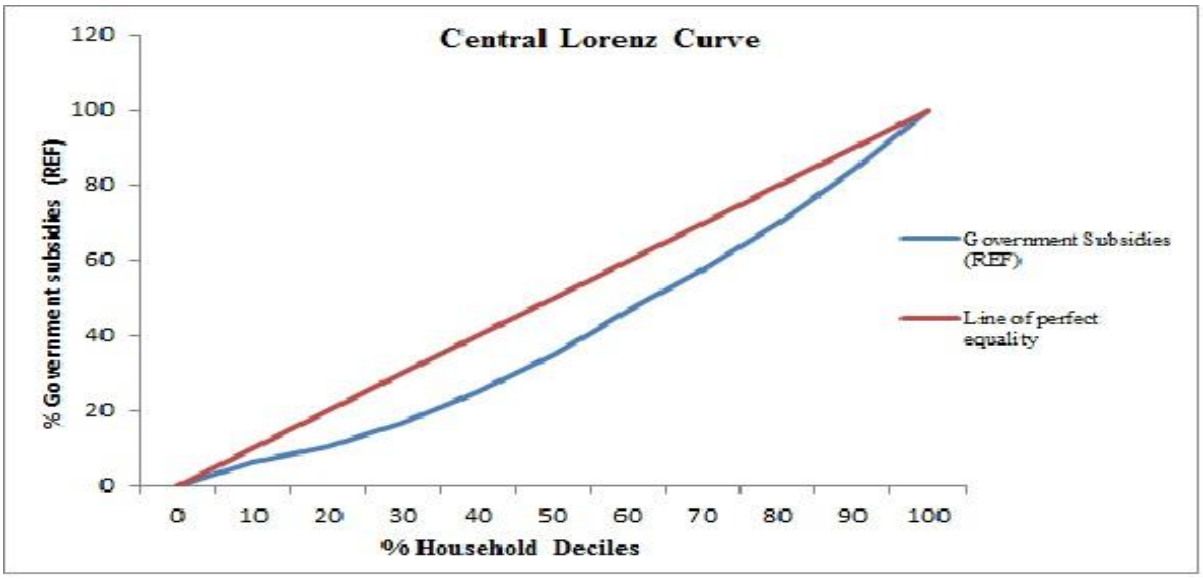

Figure 4.5: Benefits (REP) incidence for Central province-2005/6

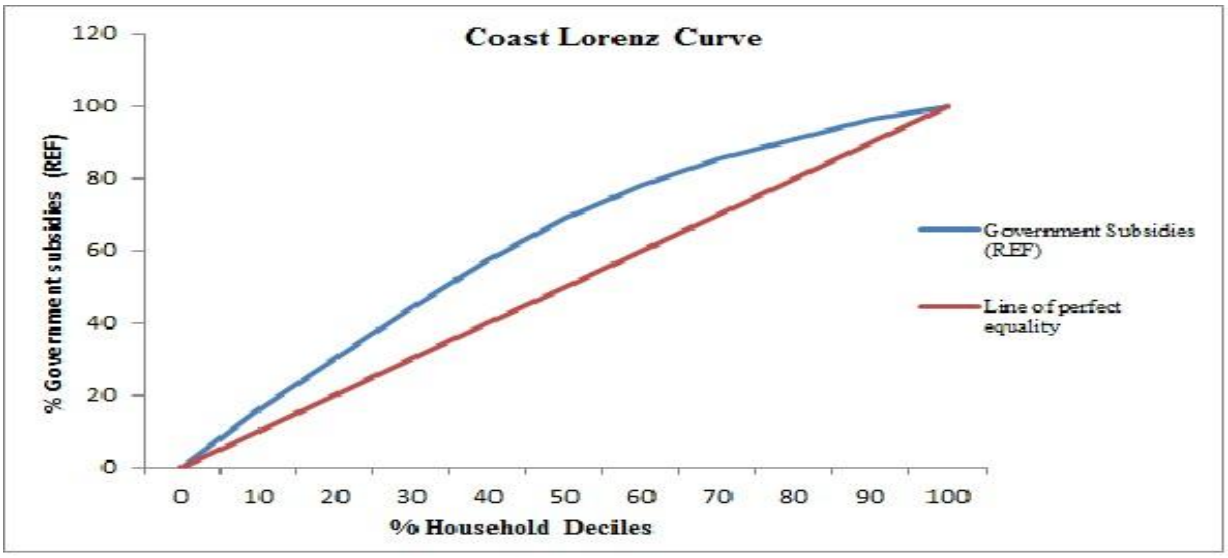

Figure 4.6: Benefits (REP) incidence for Coast province-2005/6

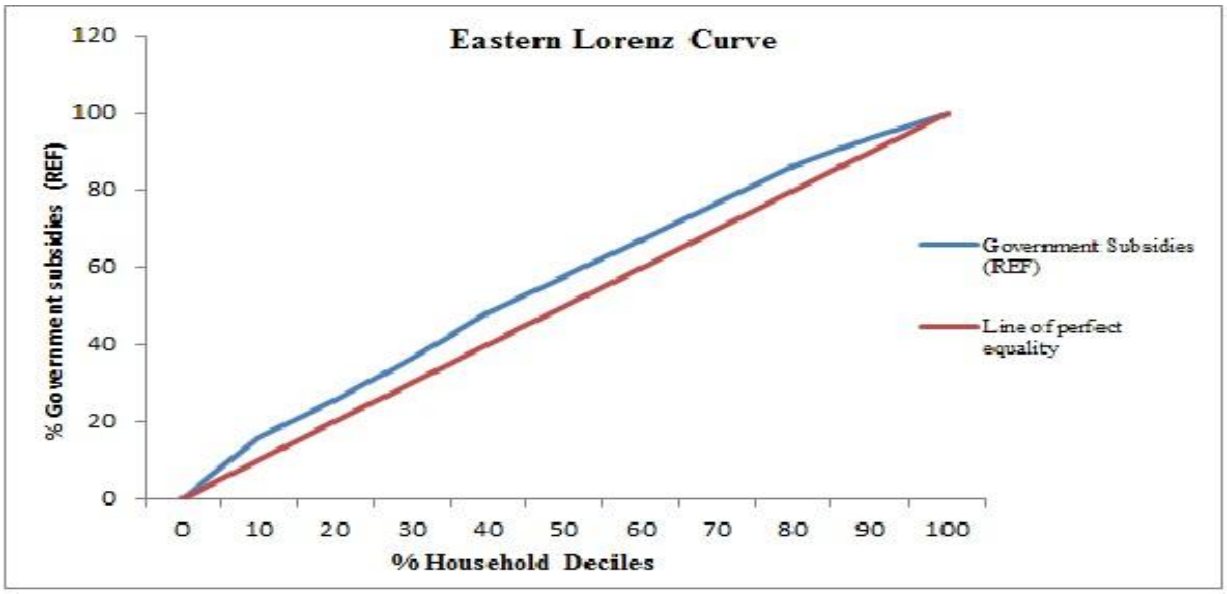

Figure 4.7: Benefits (REP) incidence for Eastern province-2005/6

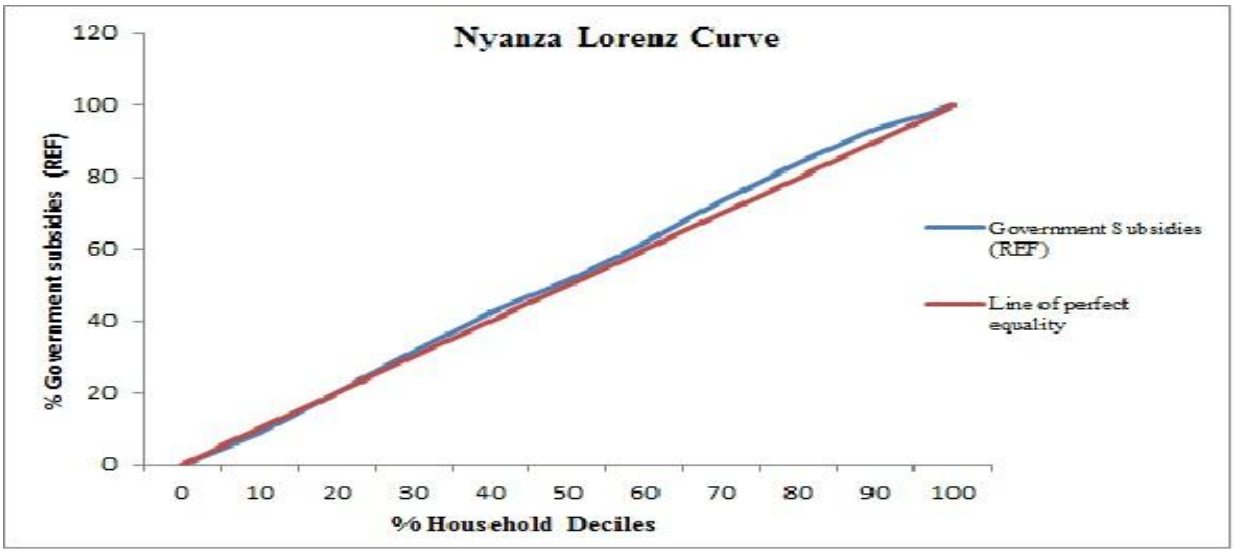

Figure 4.8: Benefits incidence for Nyanza province-2005/6

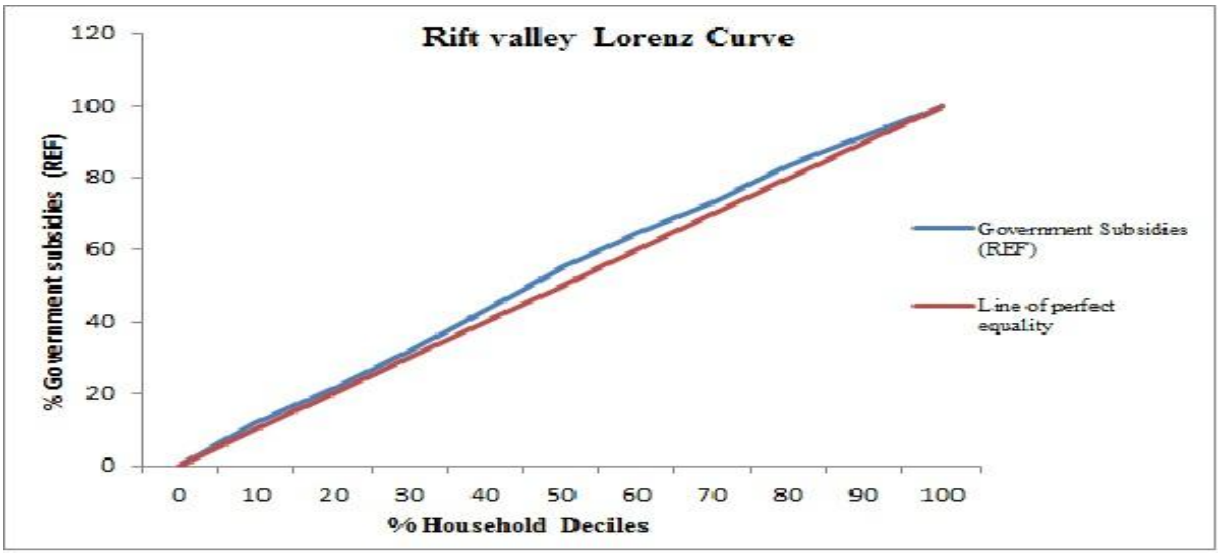

Figure 4.9: Benefits incidence for Rift valley province-2005/6

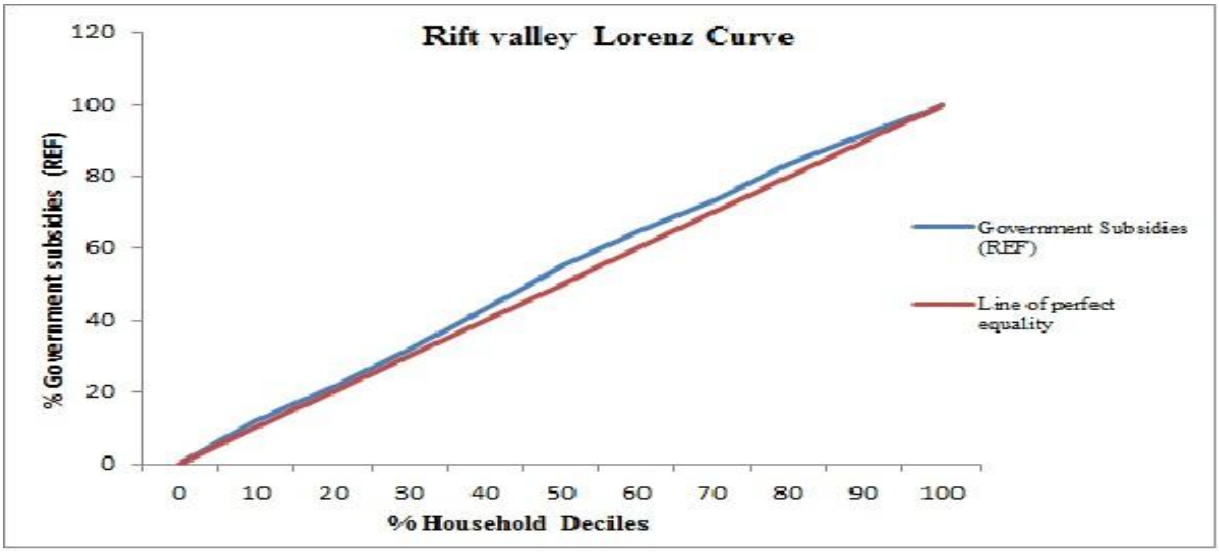

Figure 4.10: Benefits incidence for Western province-2005/6

APPENDIX II

Table7: List of Public connections - 2005/6 – Districts

PROVINCE	DISTRICT	No. of facilities	District	No. of facilities
Central	Nyandarua	**7**	Baringo	**3**
Rift valley	Kericho	**2**	Busia	**1**
Coast	Mombasa	**1**	Mumias	**2**
Nyanza	Kisumu	**2**	Meru Central	**12**
Eastern	Kitui	**3**	Trans Nzoia	**2**
Nyanza	Kisii	**5**	Nairobi	**2**
Nyanza	Nyamira	**5**	Koibatek	**2**
Rift valley	Laikipia	**2**	Kilifi	**3**
Coast	Lamu	**1**	Suba	**1**
Central	Kiambu	**4**	Migori	**3**
Western	Lugari	**1**	Kirinyaga	**3**
Western	Kakamega	**2**	Nakuru	**10**
Eastern	Machakos	**9**	Narok	**1**
Eastern	Makueni	**6**	Nyando	**3**
Coast	Malindi	**1**	Marsabit	**1**
Eastern	Embu	**3**	Samburu	**3**
Central	Maragua	**10**	Mbeere	**1**
	Muranga	**8**	West pokot	**1**
	Nyeri	**35**	Nakuru	**3**
Coast	Kwale	**15**	Meru North	**1**
Central	Thika	**17**	Nandi	**1**
Rift valley	Kajiado	**4**	Vihiga	**1**
Nyanza	Rachuonyo	**1**		
Rift valley	Keiyo	**1**		
	Siaya	**5**		
			TOTAL	**212**

APPENDIX III

Table 8: Gini Coefficients for all the districts (REP 2005/6)

District	Gini coefficient	District	Gini coefficient	District	Gini coefficient
Kiambu	**0.49**	Marsabit	**1.00**	Suba	**0.99**
Kirinyaga	**0.79**	Mbeere	**0.97**	Bondo	**1.00**
Muranga	**0.39**	Meru central	**0.26**	Nyando	**0.91**
Nyandarua	**0.79**	Moyale	**1.00**	Baringo	**0.94**
Nyeri	**0.65**	Mwingi	**1.00**	Bomet	**1.00**
Thika	**0.01**	Meru North	**0.96**	Keiyo	**0.97**
Maragua	**0.66**	Tharaka	**1.00**	Kajiado	**0.54**
Kilifi	**0.98**	Meru South	**1.00**	Kericho	**0.94**
Kwale	**0.77**	Garissa	**1.00**	Koibatek	**0.96**
Lamu	**0.96**	Mandera	**1.00**	Laipkipia	**0.88**
Mombasa	**1.00**	Wajir	**1.00**	Marakwet	**1.00**
TaitaTaveta	**1.00**	Gucha	**1.00**	Nakuru	**0.61**
Tana River	**1.00**	Homa bay	**1.00**	Nandi	**0.96**
Malindi	**1.00**	Kisii	**0.89**	Narok	**0.94**
Embu	**0.90**	Kisumu	**0.96**	Bungoma	**1.00**
Isiolo	**1.00**	Kuria	**1.00**	Samburu	**1.00**
Kitui	**0.99**	Migori	**0.91**	Transmara	**1.00**
Makueni	**0.82**	Nyamira	**0.88**	Transnzoia	**0.97**
Machakos	**0.72**	Rachuonyo	**0.98**	Turkana	**1.00**
Busia	**0.99**	Siaya	**0.87**	UasinGichu	**1.00**
Mt.Elgon	**1.00**	Vihiga	**0.98**	West Pokot	**0.97**
Kakamega	**0.98**	Butere/Mumias	**0.94**	Buret.	**0.96**
Teso	**1.00**	Lugari	**0.97**		

APPENDIX 1V

Table 9: Expenditure distribution by district based h/hold deciles – Rural 2005/6.

	Unit share of govt subsidy	NOof facilities electrified	Decile 1 696-0	Decile 2 942-5	Decile 3 1151-3	Decile 4 1355-9	Decil 5 1585-0	Decile 6 1884-8	Decile 7 2257-7	Decile 8 2792.9	Decile 9 3692-7	Decile 10 3692-7
DISTRICT		**(b)**	**(c)**	**(d)**	**(e)**	**(f)**	**(g)**	**(h)**	**(i)**	**(j)**	**(k)**	**(l)**
Kiambu	3.933962	4	0.14	0.47	0.99	0.76	1.24	1.51	1.40	2.82	1.32	0
Kirinyaga	3.93396	3	-	0.59	0.84	0.74	1.07	1.84	0.91	1.82	1.94	2.05
Muranga	3.93396	8	1.70	1.23	1.07	3.52	2.64	3.27	3.65	3.75	4.53	6.11
Nyandarua	3.93396	7	2.20	2.42	3.03	3.11	2.64	3.75	2.34	2.31	3.66	2.07
Nyeri	3.93396	35	12.12	7.99	6.06	7.44	14.04	15.01	17.07	20.52	20.93	16.52
Thika	3.93396	17	8.49	0.74	4.01	4.61	8.43	6.75	5.68	9.56	8.69	9.90
Maragua	3.93396	10	0.94	2.83	2.36	4.29	3.97	5.19	7.36	3.42	5.59	3.38
Kilifi	3.93396	3	1.33	2.44	1.57	1.82	1.72	0.78	0.79	0.45	0.65	0.25
Kwale	3.93396	15	8.85	12.04	14.75	4.31	7.61	4.01	1.53	1.24	2.36	2.30
Lamu	3.93396	1	-	0.11	0.38	0.61	0.45	0.32	0.49	0.67	0.53	0.39
Mombasa	-	-	-	-	-	-	-	-	-	-	-	-
TaitaTaveta	3.93396	0	-	-	-	-	-	-	-	-	-	-
River	3.93396	0	-	-	-	-	-	-	-	-	-	-
Malindi	3.93396	1	1.03	0.63	0.52	0.65	0.29	0.32	0.31	0.14	0.04	
Embu	3.93396	3	0.96	0.86	0.61	0.97	1.62	1.52	0.83	2.18	1.27	0.98
Isiolo	3.93396	0	-	-	-	-	-	-	-	-	-	-
Kitui	3.93396	36	1.14	1.98	2.02	2.03	1.00	0.89	0.89	1.16	0.64	0.06

Makueni	**3.93396**			**2.81**	**3.68**	**2.62**	**4.56**	**2.12**	**2.27**	**0.45**	**2.64**	**0.68**	**1.77**
Machakos	**3.93396**	**9**		**5.06**	**4.07**	**4.74**	**2.80**	**4.92**	**2.80**	**3.19**	**2.44**	**2.62**	**2.76**
Marsabit	**3.93396**	**1**		**2.10**	**0.48**	**0.65**	**0.33**	**0.09**	**0.15**	**0.02**	**0.08**	**0.02**	**0.02**
Mbeere	**3.93396**	**1**		**0.39**	**0.44**	**0.44**	**0.61**	**0.28**	**0.42**	**0.50**	**0.29**	**0.31**	**0.25**
Meru central	**3.93396**	**12**		**-**	**1.13**	**2.41**	**4.44**	**3.59**	**7.03**	**6.47**	**6.42**	**8.31**	**7.41**
Moyale	**-**	**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Mwingi	**-**	**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Meru North	**3.93396**	**1**		**0.13**	**0.11**	**0.26**	**0.39**	**0.41**	**0.38**	**0.50**	**0.74**	**0.61**	**0.41**
Tharaka		**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Meru South		**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Garissa		**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Mandera		**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Wajir		**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Gucha		**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Homa bay		**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Kisii	**3.93396**	**5**		**1.20**	**2.87**	**3.01**	**2.28**	**1.26**	**2.36**	**1.87**	**1.87**	**1.85**	**1.10**
Kisumu	**3.93396**	**2**		**0.29**	**1.32**	**0.65**	**1.00**	**1.17**	**0.57**	**1.58**	**0.54**	**0.32**	**0.42**
Kuria			**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Migori	**3.93396**	**3**		**1.26**	**1.10**	**1.16**	**1.14**	**0.46**	**1.73**	**2.15**	**0.87**	**0.99**	**0.93**
Nyamira	**3.93396**	**5**		**1.16**	**1.65**	**2.69**	**2.75**	**2.12**	**1.93**	**1.59**	**1.69**	**2.83**	**1.24**
Rachuonyo	**3.93396**	**1**		**0.27**	**0.44**	**0.35**	**0.33**	**0.43**	**0.70**	**0.63**	**0.36**	**0.23**	**0.18**
Siaya	**3.93396**	**5**		**1.59**	**1.02**	**2.64**	**1.99**	**1.71**	**2.48**	**2.54**	**1.26**	**3.19**	**1.26**
Suba	**3.93396**	**1**		**0.30**	**0.51**	**0.62**	**0.43**	**0.31**	**0.28**	**0.34**	**0.63**	**0.44**	**0.08**
Bondo		**0**		**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Nyando	**3.93396**	**3**		**0.77**	**1.38**	**1.00**	**1.55**	**1.35**	**0.98**	**1.65**	**1.20**	**1.03**	**0.90**
Baringo	**3.93396**	**3**		**1.65**	**1.76**	**1.53**	**1.44**	**1.05**	**1.01**	**0.99**	**0.63**	**1.17**	**0.57**
Bomet			**0**	-	-	-	-	-	-	-	-	-	-
Keiyo	**3.93396**	**1**		**0.11**	**0.19**	**0.61**	**0.63**	**0.52**	**0.39**	**0.67**	**0.31**	**0.23**	**0.26**
Kajiado	**3.93396**	**4**		**0.17**	**0.13**	**0.25**	**0.61**	**1.23**	**1.67**	**1.43**	**3.08**	**2.56**	**4.59**
Kericho	**3.93396**	**1**		**0.08**	**0.34**	**0.41**	**0.63**	**0.34**	**0.33**	**0.44**	**0.50**	**0.30**	**0.55**
Koibatek	**3.93396**	**2**		**0.53**	**0.54**	**1.12**	**0.97**	**1.16**	**0.54**	**1.27**	**1.16**	**0.20**	**0.38**
Laipkipia	**3.93396**	**2**		**0.46**	**0.63**	**1.20**	**1.06**	**0.80**	**0.42**	**0.61**	**0.56**	**0.97**	**1.16**
Marakwet		**0**		-	-	-	-	-	-	-	-	-	-
Nakuru	**3.93396**	**10**		**0.51**	**2.12**	**5.00**	**4.84**	**3.66**	**4.96**	**5.70**	**3.93**	**4.72**	**3.89**
Nandi	**3.93396**	**1**		**0.30**	**0.22**	**0.55**	**0.54**	**0.39**	**0.45**	**0.41**	**0.42**	**0.26**	**0.39**
Narok	**3.93396**	**1**		**0.18**	**0.18**	**0.12**	**0.46**	**0.24**	**0.25**	**0.55**	**0.43**	**0.96**	**0.57**
Samburu	**3.93396**	**3**		**3.58**	**2.01**	**1.68**	**0.92**	**0.86**	**0.68**	**1.23**	**0.19**	**0.66**	
Transmara		**0**		-	-	-	-	-	-	-	-	-	-
Transnzoia	**3.93396**	**2**		**0.65**	**0.96**	**0.71**	**1.10**	**1.13**	**0.69**	**0.87**	**0.93**	**0.57**	**0.26**
Turkana		**0**		-	-	-	-	-	-	-	-	-	-
UasinGichu		**0**		-	-	-	-	-	-	-	-	-	-
West Pokot	**3.93396**	**1**		**0.69**	**0.65**	**0.49**	**0.35**	**0.63**	**0.27**	**0.26**	**0.16**	**0.14**	**0.29**
Buret	**3.93396**	**1**		**0.02**	**0.36**	**0.17**	**0.37**	**0.64**	**0.55**	**0.36**	**0.50**	**0.57**	**0.40**
Bungoma		**0**		-	-	-	-	-	-	-	-	-	-
Busia	**3.93396**	**1**		**1.00**	**0.53**	**0.57**	**0.32**	**0.50**	**0.28**	**0.26**	**0.16**	**0.20**	**0.11**
Mt.Elgon		**0**		-	-	-	-	-	-	-	-	-	-
Kakamega	**3.93396**	**2**		**0.87**	**0.84**	**0.80**	**1.10**	**1.82**	**0.34**	**0.72**	**0.63**	**0.58**	**0.17**
Lugari	**3.93396**	**1**		**0.18**	**0.52**	**0.52**	**0.44**	**0.45**	**0.46**	**0.36**	**0.43**	**0.32**	**0.25**

Teso		**0**	-	-	-	-	-	-	-	-	-	-
Vihiga	**3.93396**	**1**	**0.18**	**0.33**	**0.30**	**0.44**	**0.54**	**0.57**	**0.29**	**0.73**	**0.33**	**0.21**
Butere/Mumias	**3.93396**	**2**	**0.20**	**1.18**	**1.36**	**0.95**	**0.57**	**1.24**	**0.71**	**0.72**	**0.37**	**0.56**
Total connections		**204**										