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POVERTY ALLEVIATION IN SOUTHERN SUDAN: THE CASE OF RANK COUNTY

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Abstract

The main objective of this study is to investigate the poverty status and its determinants in Rank County, Upper Nile State-Southern Sudan. Both primary and secondary data were used. The sample size reached 245 urban and rural households. Different analytical methods were used, namely: Foster, Greer and Thornback (FGT) and inequality measures, poverty profiling, and multivariate regression analysis. The study also conducted simulation scenarios of selected variables. The results revealed that about 87 and 73 percent of the urban and rural household fall below a calculated poverty line of SDG 3.5/person/day for urban and 2.38 for rural. The estimated Gini coefficient was 17.6 percent for urban and 19.7 percent for rural. In general, poverty incidence, gap and severity are more prevalent among urban than rural households in the County. The poorer households in Rank are more likely to belong to: large family size, younger household heads in the rural areas with no livestock ownership (cows, sheep and poultry) but have small plots for crop cultivation, female headed households who do not have access to land and seasonal labor opportunities, household heads engaged in small private sector employment, petty trading and unskilled and landless labor (termed as Gangos) operations. The results of the determinants analyses indicated that secondary education, widow household heads, female household heads, government and private sector employees, petty traders, Gangos, dysentery infection, mixed source of water are the main poverty determinants in the urban area. On the other hand, rural poverty determinants are: university education, married household heads, household size, female household heads, farmers, Gangos , petty traders, idle crop production plots, goats' ownership and numbers of chicken per households. Simulation results showed that it is imperative to involve the government more closely in providing the social amenities especially the supply of drinking water, health, education and electricity services to relieve pressure on the poor in both urban and rural societies.

ملخص

تسعى هذه الدراسة إلى داراسة حالة الفقر ومحدداتها في مقاطعة رانك ، بولاية جنوب السودان بأعالي النيل. وقد تم تجميع مصادر البيانات المصادر الاولية والثانوية. بلغ حجم العينة 245 أسرة في المناطق الحضرية والريفية. واستخدمت أساليب تحليلية مختلفة ، وهي : فوستر ، وجرير و ثورنباك (FGT) ومقاييس عدم المساواة ، ورسم صورة الفقر ، وتحليل انحداري متعدد المتغيرات . كما أجرت الدراسة أيضا سيناريوهات محاكاة لمتغيرات محددة . وكشفت النتائج أن حوالي 87 % و 73 % من الأسر في كلا من المناطق الحضرية والريفية تقع تحت خط الفقر المقدر 3.5/ SDGفرد/يوم في المناطق الحضرية و 2.38في الريف. ويقدر معامل جيني 17.6 في المئة في المناطق الحضرية و 19.7 في المئة في المناطق الريفية. و بصفة عامة، يعد الفقر، واتساع فجوته وشدته أكثر انتشارا بين الأسر الريفية عن المناطق الحضرية في المقاطعة . ونجد أن الأسر الفقيرة في رانك تكون في الأغلب إما أسر كبيرة الحجم، و رب الأسرة صغير فى السن خاصة في المناطق الريفية هذا مع مع عدم ملكيتة للثروة الحيوانية من (الأبقار والأغنام والدواجن) ولكن قد يمتلك قطع صغيرة من الاراضى لزراعة المحاصيل. و إما أسر تعيلها النساء اللاتى لا تستطعن ملكية الأراضي أوالحصول على فرص عمل موسمية ، وفى العادة نجد أن أرباب أسر العاملين في القطاع الخاص صغير الحجم، والتجارة البسيطة غير الماهرة والعمالة المعدمة (تسمى Gangos). وأشارت نتائج تحليل المحددات أن التعليم الثانوي ، وأرباب الأسر من الأرمل، وأرباب الأسرمن الإناث ، وموظفي الحكومة والقطاع الخاص ، وصغار التجار ، وGangos ، وعدوى الزحار ، ومصادر المياه المختلطة هي المحددات الرئيسية للفقر في المناطق الحضرية. و من ناحية أخرى ، فإن محددات الفقر في المناطق الريفية هي : التعليم الجامعي ،و أرباب الأسر المتزوجين ، وحجم الأسرة ، و أرباب الأسر من الإناث ، والمزارعين ، Gangos ، و صغار التجار ، و الأراضي التى تنج المحاصيل الراكدة ، والماعز وعدد الدجاج في كل منزل. وأظهرت نتائج المحاكاة أنه لا بد من إشراك الحكومة بشكل وثيق في مجال توفير وسائل الراحة الاجتماعية وخاصة توفير مياه الشرب والصحة والتعليم وخدمات الكهرباء لتخفيف الضغط على الفقراء في المجتمعات الحضرية والريفية على حد سواء.

1. Introduction and the Problem of the Study

Poverty is a major challenge in Southern Sudan, with seriously degraded education, health, water and sanitation services, compounded by the long civil conflict (1955–1972 and 1982–2005) and natural disasters. Adult illiteracy rate reached 75% of total population (GOS, UNCT 2004), only 27% of dwellers had access to safe drinking water, 16% had access to sanitation facilities and primary school enrolment was 20% (AEPRC, ARC, ICARDA, 2009).

The Comprehensive Peace Agreement (CPA) of 2005, which halted the North-South war, promised an equitable redistribution of the country's wealth to be implemented within an interim period of six years (2005–2011). This study evaluates the poverty situation after CPA taking the Rank County of the Upper Nile state of Southern Sudan as a case study to investigate the expected changes of the peace pact.

Rank County has an area of 23,000 square kilometers in the northern part of Upper Nile State. Its climate belongs to the semi-arid zone with annual average rainfall ranging between 400-800 mm. (De Zuviria 1992). The county depends on the White Nile River, a few seasonal streams, manmade dug pools (haffirs) and irrigation canals[1] as the main sources of drinking water (Anyong 2007).

Rank County's population was estimated at 137750 persons (CBS and SSCCSE 2009). Most of the population earns low income and they are involved in a subsistence economy, small scale farming on clay and heavy loamy soils (Onak 2005), collecting Arabic gum and fish hunting (AEPRC, ARC, ICARDA 2009). Rank County has one hospital and few health centers and clinics, 38 basic schools, 8 secondary schools and 2 universities (Administration Unit of Rank County, 2008).

1.1 Objectives of the Study

The main objective of this study is to investigate the poverty situation and its main determinants in urban and rural households of Rank County in Southern Sudan.

Specifically the study aims to:

1. Establish a poverty line and estimate poverty incidence, gap, severity and equality measures,
2. Establish a poverty profile,
3. Identify the main determinants of poverty, and
4. Recommend policy scenarios for actions to alleviate poverty in Rank County.

1.2 Hypotheses of the Study

1. The majority of urban and rural households in Rank County are poor,
2. Inequality is high among different income groups
3. Poverty incidence, gap and severity are associated with community, household and household individual characteristics in the County,
4. Education, occupation, gender, household size, assets ownership, credit, and access to amenities are the main determinants of poverty in the Rank County.

2. Research Methodology

2.1 Data collection

The study depends mainly on primary data obtained from a field survey involving urban and rural households of Rank County. A simple random technique has been used, since the respondents belong to interrelated tribes and thus portray homogeneous characteristics.

[1] The irrigation canal belongs to idle irrigated pump schemes in the Rank County.

The sample size is 245 households, about 0.2% of the County's population. Only 200 respondents had full questionnaires; 75 of those were urban and 125 were rural households.

The vast area of the county and the security situation made total population coverage almost impossible. Accordingly, using the Rank County Administration Unit information, the district has been classified into Payams (residential towns) and large number of villages, each termed as Buma (residential village). From each of the five Payams 15 households were selected[2]. Also 12 Bumas were selected to cover equivalently the four geographical locations in the County, and from each selected Buma about 10 to 12 households were selected totaling to 125 respondents.

The field survey continued for a period of 90 days extending from November 2008 to January 2009.

2.2 Methods of analysis

2.2.1 Poverty Line

2.2.1.1 Cost of Basic Needs Poverty Line

In this study, the average per capita daily food consumption for the households in Rank County in the middle quintile was specified and converted into its equivalent caloric values using the Sudan Food Composition Table (1986). These caloric values of per adult equivalent were scaled up to determine the required quantity of calories to bridge the gap for attaining the recommended level of 2300 calorie/day based on FAO and others (FAO 1996; Lutheran World Federation 2001[3]; Elmulthum 2007). According to Haughton and Khandker (2009), the food poverty line (zF) was derived by estimating the cost of the adult equivalent recommended calories per day amounting to SDG1.83 for urban and SDG 1.85 for the rural (annex 1 and 2).

The Engel curve was used for estimating the non-food component (zNF) (annex 3) according to Ravallion (1998) as follows:

$$W_i = \alpha + \beta \log Y_i \text{ - - - - -(1)}$$

Where

Wi = budget share for food for observation i which is obtained by dividing food expenditure by total expenditure,

Yi = total per capita expenditure for each individual divided by the food poverty line which had been estimated on the basis of the calorie intake and the prevailing prices at the time of the data collection.

Based on Engel curve results and the food poverty lines, the upper poverty line (ZU) is estimated at about SDG3.5 per person per day and SDG2.38 per person per day for urban and rural areas respectively depending on the following equation which was developed by Ravallion (1998)

$$\text{Zu} = (1+\beta) * \text{Zf} / (\alpha + \beta) \text{ - - - - -(2)}$$

Where:

α = constant of the Engel Curve equation (1).

[2] The five Payams are: Wanto, Rank, Shomidi, Geiger and Jelhak.

[3] Its report (Focusing on the Future at Kakuma Refugee camp in Kenya)—in support of Southern Sudan refugees—stated that refugees get 1600 cal/day/person which is still below the recommended 2300 cal/day.

β = coefficient to be estimated when calculating Engel Curve equation (1).

Zf = Food poverty line obtained in annex 1 and 2.

2.2.1.2 The World Bank Poverty Line Indicators

The World Bank poverty line indicators (of $1, $1.25 and $2 per person per day) have been introduced according to Haughton and Khandker (2009) and converted[4] to SDG.

2.2.2 FGT Measures

The Foster, Greer and Thornback (FGT) (1984) indicators were used to classify poverty in Rank County. These indicators measure the head count ratio (the percentage of the population whose daily per capita total consumption expenditure falls below the district level poverty line) as well as the poverty gap ratio (the distance separating the population from the poverty line) and the poverty severity (the inequality among the poor) for urban and rural households.

2.2.3 Distribution Measures

Distribution measures were used to indicate how income is distributed among the population. Todaro (1996) stated that the gap between rich and poor measures the breadth and depth of poverty. The income inequality can be measured by using:

2.2.3.1 The Lorenz Curve

The Lorenz Curve shows the actual quantitative relative relationship between percentage of income recipients and the percentage of the total income they received. The more the curve is away from the diagonal (perfect equality) the greater the degree of inequality (Todaro, 1996).

2.2.3.2 The Gini Coefficient

It is a convenient measure of income inequity. If the Gini coefficient is zero it means perfect equality, when it is one it means perfect inequality (Haughton and Khandker 2009).

The FGT measures, the Lorenz curve and the Gini coefficient were estimate using Distributive Analysis/Analysis Distributive (DAD) software. DAD is designed to facilitate the analysis and the comparisons of social welfare, inequality, poverty and equity using micro data (Araar and Duclos 2006)

2.2.3.3 Quintile Dispersion Ratio (QDR)

This study uses the Quintile Dispersion Ration (QDR), which is obtained by dividing the average consumption of the richest 20 percent (first quintile) by that of the poorest 20 percent (fifth quintile) (Haughton and Khandker 2009).

2.2.3.4 Food Share

The share of food of total expenditure was used as a measure of poverty and inequality among urban and rural households. This is based on the assumption that poor households spend most of their income on food.

2.3 Poverty Profile

Poverty profile investigates the prototype of poverty to observe how poverty varies geographically (urban vs. rural) and how it varies according to community characteristics (access to public goods such as health, education, drinking water) and household characteristics (assets ownership, land holding, household size, dependency ratio, occupation, employment, spending, etc.), and household head characteristics (age, marital status, gender, etc.). In building the poverty profile, descriptive statistics and cross tabulation were used (Haughton and Khandker 2009).

[4] At the time of data collection the exchange rate of US $ was equivalent to SDG 2.23 per US$1.

2.4 Descriptive Statistics

Descriptive statistics such as frequencies, averages and standard deviation measures were used to obtain and summarize the preliminary findings on the respondents' socioeconomic characteristics in Rank County.

2.5 Regression Model for Poverty Determinants

In this study, consumption expenditure has been used as a dependant variable instead of income. This is because information and data on income are difficult to obtain especially in developing countries, and particularly among low income groups who don't have sustained sources of income or can't recall correctly the amount of income (Coudouel et al. 2002).

Regression is a useful technique for summarizing data and is widely used to test hypotheses and to quantify the influence of independent variables on a the dependent variable (Haughton and Khandker 2009). The regression equation used in this study could be written as:

$$Log(\frac{Y_i}{Z}) = \alpha + \beta_1 X_1 + \beta_2 X_2 + ...+ \beta_{30} X_{30} ------(3)$$

Where

Y_i is per capita expenditure/day in SDG,

X1 to X30 are the explanatory variables including: education (illiterate, pre-secondary, secondary and university); household head marital status (married and widow); household size; female household headed; primary occupations (farmers, government employees, private sector employees, petty traders, and unskilled and landless labor termed as Gangos); secondary occupations (farmers, government employees, private sector employees, petty traders, and Gangos); diseases (Typhoid, Bilharzias, Dysentery), and amenities (water from public net and water from natural resources and public net (termed as mixed water sources) and credit.

2.6 Poverty Exit Paths Simulations

The study selected some factors (health, education, water and electricity) that constitute a high share of the non-food spending (annex 4). Moreover, spending on health, education, water and electricity are not only the households' responsibility but also the government's. Based on the above justification six scenarios were developed (Table 1).

3. Results and Discussion

3.1 Poverty Profile in Rank County

Table 2 shows the prevalence of poverty in Rank County. The high incidence of poverty could be attributed to the high influx of Internally Displaced People (IDPs) and refugees during the war time with limited work opportunities in the County and hence low wages and salaries for seasonal labor and government and private sector employees.

In general, with the increasing cost of living in Southern Sudan, the poverty incidence could go up to 95% of the total households in urban and rural areas of Rank County.

3.2 Selected Community Characteristics

3.2.1 Access to Education, Drinking Water, Latrines, Health Situation and Electricity

Tables 3 to 6 show that the access of households to standard amenities are almost absent in the County, which results in poor hygiene and high infection with diseases. Regarding the access to electricity services, the survey indicates that all households in the urban and rural areas use traditional sources of lighting such as small lanterns (fanus) lit by kerosene, small hand batteries, and oil-cloth strip gauze. It has to be noted that electricity lines are limited to government offices and a limited number of houses in one of the towns in Rank County.

3.3 Selected Households Characteristics

3.3.1 Household Size

The obtained results for households in Rank County are in line with Lanjouw and Ravallion (1995) who found cross-country evidence in Bangladesh that larger households, and households with a large number of children, are more likely to be poor.

3.3.2 Agricultural Land Ownership and Poverty Incidence

Agricultural land ownership is assumed to be one of the most important variables in poverty alleviation, particularly in rural areas.

According to Deininger (2003) "I*n developing countries, most land is used for agricultural production, a mainstay of economic sustenance. The possession of land rights also typically ensures a baseline of shelter and food supply and allows people to turn latent assets into live capital through entrepreneurial activity. Once secure in their land rights, rural households invest to increase productivity. Moreover, the use of land as a primary investment vehicle allows households to accumulate and transfer wealth between generations. The ability to use land rights as collateral for credit helps create a stronger investment climate and land rights are thus, at the level of the economy, a pre-condition for the emergence and operation of financial markets."*

In the rural areas of Rank County it was found that as the cultivated land increased poverty decreased (table 7). In contrast, in the urban area there is no relation between the size of the cultivated land and the poverty incidence of those cultivating the land. This is because those urban households who own land do not have the time or resources to cultivate their land and the difficulties to reach their land due to the absence of all roads during the rainy season. Thus the land is kept idle most of the time.

3.3.3 Animal Ownership and FGT Poverty Measures

Table 7 indicates and proves that ownership of livestock such as cows, goats and poultry has a positive effect on alleviating poverty as they contribute significantly to food security. It is also clear that those who have cows are in a much better position than those who have goats.

3.4 Poverty Distribution

Several measures have been applied to estimate the distribution of poverty in Rank County. The Lorenz curve indicated no significant differences in poverty distribution among the different income segments in the urban and rural areas of the county (figures 1 and 2). The QDR reveals different spending levels on food between the richest and poorest segment in the two areas. The gap in spending between the two segments in the two areas is similar, while the gap in food spending is less remarkable in the urban area compared to the rural area. Hence the urban segment spends highly on non-food, while most the rural households' spending goes to food.

The value of the Gini coefficient is 0.18 in case of urban households and 0.20 in case of rural households implying the existence of relative equity in total spending distribution among households in the two areas of Rank County. This may verify the results obtained in case of the Lorenz curve and QDR.

3.5. Poverty Determinants of Household Spending Level in Rank County

Table 9 shows that the results of R square are in line with Haughton and Khandker (2009), who stated that with household survey data, one is often pleased to get an R square of 0.5 or more. The table indicates the main determinants of poverty in Rank County in terms of education, marital status, widow status, household size, female headed household, occupation, assets ownership, and disease infection.

The effect of education of household head is rather ambiguous. Secondary level education seems to add an extra burden rather than support the household head in the urban area. On the other hand, university education does not seem to be an asset in the rural area of Rank County. These results disagree with Geda et al. (2005) for Kenya where educational attainment of household-heads (high school and university education) were influential in poverty alleviation. Widows, on the other hand do not suffer from poverty as they receive social support and charity from the society.

The marital status has no effect in case of urban households, but it worsened the poverty situation in rural areas. This may be explained by the high dependency ratio due to the widespread polygamy in the rural area. This again is opposite to the findings of Geda et al. (2005), which indicated that living standards were worse for urban rather than rural households due to polygamy in Kenya.

The size of the household worsened the poverty status in both rural and urban households in Rank County, which is in line with Lanjouw and Ravallion (1995).

In line with McLanahan, Annemette and Waston (1989) and Lord (1993) which indicated that women were more likely to live in poverty than men, less spending was noted for female-headed households. Females mostly sell tea, vegetables, firewood, homemade ghee, cleaning straw-brooms and beverages at low prices in both urban and rural areas of the County. They also work as junior staff and laborers in government offices at low salaries and wage rates.

Primary occupation of the household head helped in poverty alleviation in urban areas but not in rural areas. Low income from farming, due to crop failure and low products prices, and from Gangos, due to unreliable employment opportunities associated with low seasonal wages in rural area result in low spending and increased poverty incidence in rural households. It appears that petty trading, as a main secondary occupation, supplements the farming income of rural households. Apart from the effect of secondary employment in rural Rank County, these results were not in line with the findings of Datt and Jolliffi (1999) for Egypt, who reported a positive effect of employment on the welfare of rural households but not of urban households.

In agreement with Datt and Jolliffe (1999), the ownership of agricultural land, goats and poultry in rural areas were positive factors in increasing the level of spending on households' consumption. However, the ownership of donkeys adds the burden of feeding those animals, despite their benefits for households as transportation mediums and moving farm products and other items.

Infection with Dysentery results in reduced spending in urban areas as productivity and income of household heads are reduced due to deteriorating health, and thus activity. The results agree with Spence et al. (1993) who examined the historical link between tuberculosis and poverty in Liverpool and concluded that tuberculosis remains strongly associated with poverty. For the rural area, no significant result was detected for effect of diseases and drinking water. Nevertheless, the dependence of urban households on public net and natural resources of drinking water results in increase spending in the form of cash payment for tap water and transportation cost for accessing river and haffir water in remote areas.

3.6 Poverty Exit Paths

The results of the simulation scenarios (table 10) show a gradual reduction in poverty incidence (P0), gap (P1) and severity (P2) for urban and rural households. This may be due to the fact that before liberalization policies, the government had totally shouldered the responsibility of providing education as well as health services, free of charge. After liberalization policies, all the subsidies were removed and services were delivered at cost.

Post liberalization most of the poor people and low income households could not afford to pay for education and health services even in Khartoum, the capital of Sudan. The situation gets even worse in the other towns, especially in rural areas affected by the civil war.

4. Summary, Conclusions and Recommendations

This study establishes a poverty profile, identifies the poverty determinants and simulates an exit path for urban and rural households of Rank County in Southern Sudan. It uses different analytical methods to analyze primary data collected from 200 respondents in urban and rural areas of the county. The Cost of Basic Needs method is used to construct the food poverty line, and is entered into the Engel Curve Equation to estimate the upper poverty line. The FGT measures are used to calculate poverty incidence, gap and severity. The Lorenz curve, Quintile Dispersion Ratio (QDR) and Gini coefficient methods are used to estimate inequality measures. Descriptive statistics and FGT measures are used to establish a poverty profile while multiple regression analysis is used to identify poverty determinants. Selected variables are used in simulations to draw poverty exit policies.

The results of the study conclude that about 87% and 73% of the urban and rural household lie below the upper poverty line. Households in both urban and rural areas suffer from unavailable or limited access to basic needs (health services centers, education, water and electricity). Features most prevalent in the poverty profile are large-sized households and those who do not own cattle, goats and poultry.

The study also notes the existence of minor differences in consumption spending among urban and rural households in the county as demonstrated by the Lorenz curve and the Gini coefficient results (0.18 and 0.2 for urban and rural household). Given this situation, the QDR results depict the existence of a relatively large discrepancy in spending on food between the richest and poorest segments of the rural areas in contrast to those in the urban areas. The main determinants of poverty in urban Rank County are related to households depending on widows and female heads for income generation, low wage and salaries from government and private sector employment, low wages for unskilled and landless labor (Gangos), and dysentery infection. On the other hand, rural poverty determinants are related to high spending on large families brought around by polygamy, dependence on farming, seasonal labor wages (Gangos), and low profit petty trading activities.

Based on the results of exit-path simulation scenarios, the study recommends that the government shoulder the responsibility of providing the basic needs (health, education, water and lighting). The support of different NGOs and UN organizations may help in reducing the poverty incidence gradually, and may provide an opportunity for households to improve their community livelihood.

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Stakeholders

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2) Poal Ding: President of the Farmer Union, Rank County.

3) Kamal Abedel Aziz: General Secretary, Mechanized Farming Union, Rank County.

4) Fedit Shoal: President of Small Farmers Union, Rank County.

5) Fawzi Abdallh Sabah: The General Secretary for the Cooperative Societies, Rank County.

6) Rahma Shoal: Member of Cooperative Societies, Rank County.

7) Haron Abdel Rahman: President of Herders Union, Rank County.

8) Bior Kor Agoir: *Omda* of Dinka Bor and member of the Steering Committee of the Herders Union, Upper Nile State.

9) Aljak Alnour: member of the Fruits and Vegetables Farmers Union, Rank County.

10) Gabrial Gashwa: Deputy Director General Irrigated Sector, Rank Administration Unit.

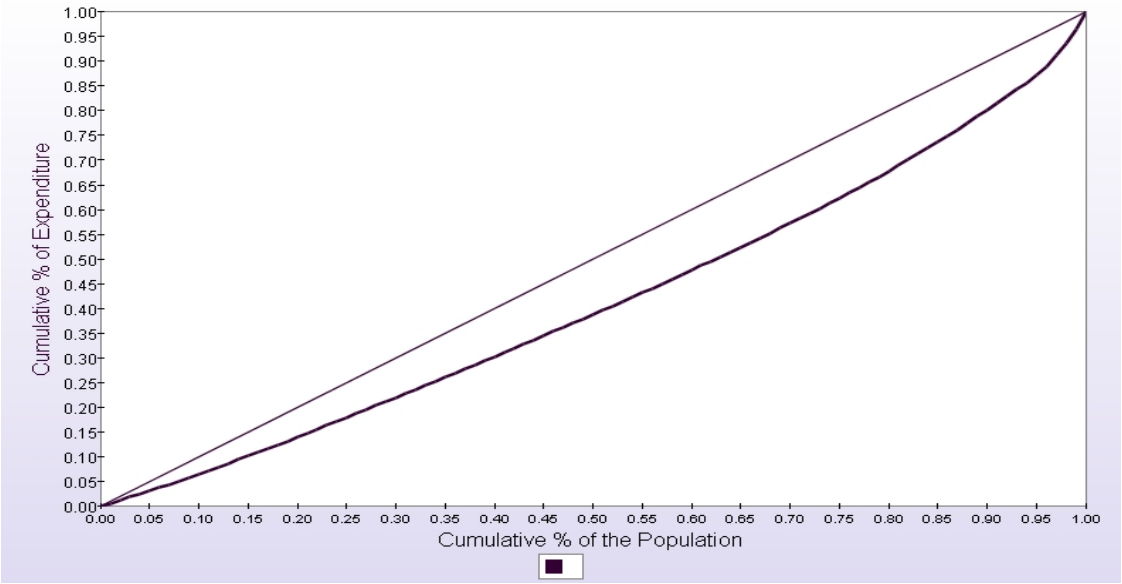
11) Gail Yagin: Omda of Malbok.

12) Al Fadil Deng: Administrative Officer, Rank County Headquarters.

13) Deng Akoi: Commissioner of Rank County.

Figure 1: Lorenz Curves Results

a. Urban



b. Urban

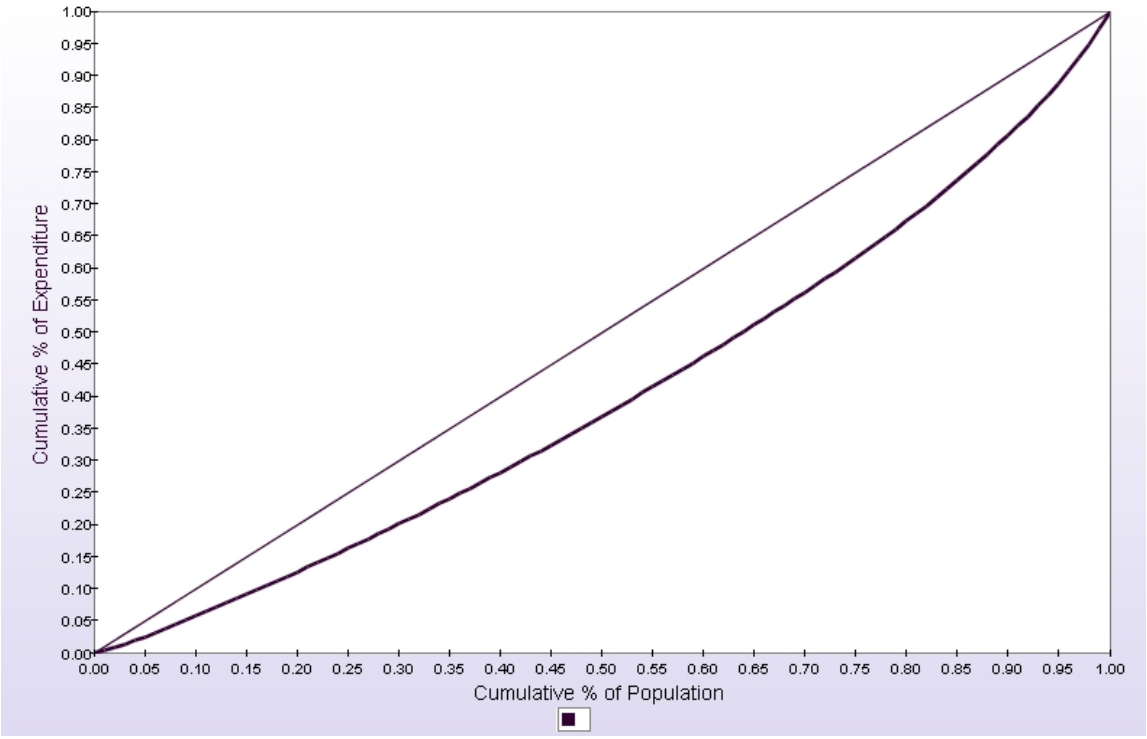


Table 1: Abbreviation and Description of the Simulation Scenarios

	Abbreviation	Description
Scenario 1	SC1	The government shoulders 50% of the health expenses
Scenario 2	SC2	The government shoulders 50 % of the health and education expenses
Scenario 3	SC3	The government shoulders 50% for health, education, water and electricity supply expenses
Scenario 4	SC4	The government shoulders 100 % of the health expenses
Scenario 5	SC5	The government shoulders 100 % of the health and education expenses
Scenario 6	SC6	The government shoulders 100 % of the health, education, water and electricity supply expenses

Table 2: Poverty Incidence, Gap and Severity in Rank County* ***(in percent unless otherwise indicated)***

	Urban	Rural
Food poverty line	1.83	1.85
Poverty line	3.5	2.38
P0	87	73
P1	30	17
P2	11	5.4
Poverty line based on ($1)	2.23	2.23
P0	41	63
P1	4	14
P2	0.7	4
Poverty line based on ($1.25)	2.79	2.79
P0	73	82
P1	16	26
P2	4	10
Poverty line based on ($2)	4.46	4.46
P0	96	97
P1	44	5
P2	21	29

Notes: *Poverty line in SDG/person/day. Head count ratio (P0), poverty gap ratio (P1) and poverty severity (P2) are given in percentages.

Table 3: Educational Level of the Household Head, Rank County (%)

Education level	Urban	Rural
Illiterate	60	74
Pre-secondary	25	22
Secondary	13	3
University	1	1
Total	100	100

Table 4: Urban and Rural Households' Access to Drinking Water, Rank County (%)

Source of water	Urban	Rural
Tap water	35	0
Natural resources	41	100
Mixed	24	0

Table 5: Access of Urban and Rural Households to Latrines Facilities, Rank County (%)

Sanitation facility	Urban	Rural
Latrines	32	0
Outdoor	68	100

Table 6: Distribution of the Poor and Non-Poor According to Diseases Infection (%)

Disease infection	Urban		Rural	
	Poor	Non-poor	Poor	Non-poor
Malaria	86	14	73	27
Dysentery	97	3	73	27
Bilharzias	100	0	70	30
Typhoid	88	12	71	29
Cholera	100	0	100	0
Tuberculosis	75	25	70	30
Respiratory diseases	88	12	100	0
Rheumatism	88	12	72	28
Diarrhea	88	12	74	26

Table 7: Selected Households Characteristics, Rank County (%)

	Urban			Rural		
Households characteristics	P0	P1	P2	P0	P1	P2
Household size						
1-4	25	3	0.3	40	4	0.6
5-8	90	31	12	70	15.5	4.8
9-12	89	33	12.5	95	27	8.7
≥13	-	-	-	100	42	21
Total agricultural land ownership (feddan)						
Did not own agricultural land	79	29	12	66.7	18	6
1-30	100	32	11	80	19	6
> 30	100	29	9	33	6	1.5
Total cultivated land (feddan)						
Did not own cultivated land	79	28	11	67	17	6
1-15	100	33	12	82	20	6
16-30	-	-	-	70	14	4
> 30	100	25	7.6	25	4.6	1.3
Animals ownership						
Did not own cows	100	33	11	77	18	5.6
Owned cows	85	29	11	36	10	3.6
Did not own goats	94	31	11	81	22	8
Owned goats	85	30	11.5	68	15	4
Did not own poultry	92	32	12	78	18	6
Owned poultry	85	29	11	59	15	5

Table 8: Total and Food Expenditure Quintile Dispersion Ratio in Rank County

Expenditure	Quintile Dispersion Ratio	
	Urban	Rural
Total expenditure	2.3	2.6
Food expenditure	1.66	2.48

Table 9: Determinants* of Household Spending Level of Urban and Rural Households, Rank County

	Urban	Rural
Dependant variable (log per capita expenditure/day)/Poverty line		
Constant	-0.967***	2.036***
	(0.293)	(0.315)
Education		
Illiterate		
Pre-secondary	0.019	0.082
	(0.061)	(0.053)
Secondary	-0.172**	-
	(0.084)	
University	-0.089	0.418*
	(0.192)	(2.47)
Household Head Marital Status		
Married	-	-1.671***
		(0.279)
Widow	0.319***	-1.355***
	(0.094)	(0.265)
Household size	-0.108*	-0.242***
	(0.060)	(0.042)
Female headed households	-0.127*	-0.437***
	(0.077)	(0.111)
Primary Occupations		
Farmers		-0.176**
		(0.085)
Government employees	0.974***	
	(0.216)	
Private sector employees	0.734***	
	(0.237)	
Petty traders	0.884***	
	(0.218)	
Unskilled and landless labor (Gangos)	0.795***	- 0.237***
	(0.252)	(0.084)
Fishermen		-
Secondary Occupations		
Farmers	-0.188	
	(0.121)	
Government employees		-0.017
		(0.071)
Private sector employees		0.164
		(0.127)
Petty traders		0.216***
		(0.079)
Unskilled and landless labor (Gangos)	-0.004	
	(0.083)	
Fishermen	-0.008	
	(0.17)	
Assets Ownership		
Total agricultural area	0.000	0.001***
	(0.001)	(0.000)
Donkeys	- 0.019	-0.90
	(0.085)	(0.08)
Goats	0.016	0.084*
	(0.065)	(0.05)
Chicken number	- 0.004	0.008**
	(0.005)	(0.003)
Diseases		
Typhoid	0.054	-0.06
	(0.060)	(0.050)
Bilharzias	-0.050	-0.008
	(0.096)	(0.01)
Dysentery	-0.097*	-0.01
	(0.053)	(0.048)
Amenities		
Water sources: public net	0.026	-
	(0.050)	
Mixed water source (public net and natural resources)	0.399*** (0.066)	
Credit	-0.096	
	(0.073)	
R^2	79	61.2
F-value	8.18***	8.7***

Notes: *The value between parentheses is the standard error, while the other is the B coefficients. *, ** and*** indicate significance at 10%, 5 % and 1% respectively.

Table 10: FGT Measures Simulation Results (%)

Scenarios	Urban			Rural		
	P0	P1	P2	P0	P1	P2
Base	87	30	11	73	17	5.4
SC1	85	22	7	68	14	4
SC2	84	20	5.5	65	14	4
SC3	80	17	4	62	12	3
SC4	78.6	15	3	61	12	3
SC5	73	11	2	59	10	3
SC6	63	6	0.7	52	8	2

Annex 1: Main Diet for the Urban Areas

Main Diet in calories per day	Actual calories consumed	Calories required	Cal/100 gm	Cal/100 mg*1000	Calories required in Kg	Price in SDG / Kg) for the diet	Food Poverty line (SDG)
Durra	1165.76	1244.156	341	3410	0.364855	0.72	0.262696
Millet	8.534014	9.107916	386	3860	0.00236	1.1	0.002596
Wheat flour	0	0	345	3450	0	1.5	0
Fino	71.12963	75.91301	334	3340	0.022728	1.6	0.036366
Peanuts	14.78974	15.78433	564	5640	0.002799	4.5	0.012594
Arachis oil, refined	256.1809	273.4087	884	8840	0.030929	5.25	0.162375
Onion	23.85199	25.45601	58	580	0.04389	3.69	0.161953
Garlic bulb raw	0.497181	0.530616	105	1050	0.000505	9	0.004548
Meat beef raw	9.882937	10.54755	119	1190	0.008863	8	0.070908
Mea mutton raw	12.31841	13.1468	146	1460	0.009005	10	0.090047
Fresh fish	38.5934	41.18877	62	620	0.066433	1.67	0.110944
Fish dried	1.989177	2.122947	50	500	0.004246	10.5	0.044582
Milk cow fresh	48.78575	52.06653	75	750	0.069422	1.3	0.090249
Milk cow dried	6.546798	6.987062	501	5010	0.001395	27	0.037655
Goat milk	9.033782	9.641293	68	680	0.014178	1.12	0.01588
Yoghurt	8.21569	8.768185	72	720	0.012178	0.93	0.011326
Lentils peeled raw	37.46626	39.98582	348	3480	0.01149	1.67	0.019189
Fava bean	0.592593	0.632444	32	320	0.001976	3	0.005929
Beans dry white	6.114182	6.525354	343	3430	0.001902	3	0.005707
Cowpea white raw	17.61409	18.79861	335	3350	0.005612	1.67	0.009371
Lubia beans (Luba Adasi)	43.59212	46.52364	339	3390	0.013724	2	0.027448
Maize Raw	15.23049	16.25472	371	3710	0.004381	0.44	0.001928
Sugar	224.9879	240.1181	387	3870	0.062046	3.2	0.198547
Tahina	12.46396	13.30214	543.5	5435	0.002447	6	0.014685
Rice	69.02348	73.66523	360	3600	0.020463	2	0.040925
Vermicelli	12.22891	13.05129	235.5	2355	0.005542	3.05	0.016903
Banana	1.10582	1.180185	88	880	0.001341	2	0.002682
Orange	0.215438	0.229926	26	260	0.000884	4	0.003537
Guava	1.58453	1.691088	38	380	0.00445	1.5	0.006675
Water melon	4.167281	4.447525	34	340	0.013081	1	0.013081
Dates	1.134454	1.210744	201	2010	0.000602	3.3	0.001988
Okra dried raw	10.73719	11.45926	267	2670	0.004292	12	0.051502
Eggplant	0.026786	0.028587	9	90	0.000318	4	0.001271
Cucumber	0.661494	0.705978	15	150	0.004707	3.33	0.015673
Jews melon raw	4.164305	4.444349	43	430	0.010336	3.33	0.034418
Okra fresh	5.035903	5.374562	52	520	0.010336	3.56	0.036795
Purslane raw	0.947562	1.011285	18	180	0.005618	3.562	0.020012
Sweet Potato	3.242225	3.460261	69	690	0.005015	2	0.01003
Potato	3.843466	4.101935	90	900	0.004558	2	0.009115
Tomato raw	2.522203	2.691819	19	190	0.014167	4	0.05667
Lemon	0.261905	0.279518	24	240	0.001165	4	0.004659
Total	2155.074						1.723456

Annex 2: Main Diet for the Rural Areas

Main diet in calories per day	Actual calories consumed	Calories required	Cal/100 gm	Cal/100 mg*1000	Calories required .in Kg	(Price /Kg) for the diet	Food Poverty line (SDG)
Durra	1043.429	1216.203	341	3410	0.356657726	0.72	0.256794
Millet	30.32857	35.35046	386	3860	0.00915815	1.1	0.010074
Wheat flour	0	0	345	3450	0	1.5	0
Fino	17.25525	20.11243	334	3340	0.006021684	1.8	0.010839
Peanuts	12.34701	14.39147	564	5640	0.002551678	4.5	0.011483
Arachis Oil, refined	265.9108	309.941	884	8840	0.035061197	6	0.210367
Onion	18.28612	21.31398	58	580	0.036748242	4	0.146993
Garlic bulb raw	0.247768	0.288794	105	1050	0.000275042	9	0.002475
Meat beef, raw	5.120547	5.968421	119	1190	0.00501548	8	0.040124
Meat mutton ,raw	12.30366	14.34094	146	1460	0.00982256	10	0.098226
Fresh Fish	49.7533	57.99159	62	620	0.093534816	1.33	0.124401
Fish dried	2.120473	2.471587	50	500	0.004943174	10.5	0.051903
Milk cow, fresh	15.67493	18.27042	75	750	0.024360562	0.93	0.022655
Milk cow, dried	4.307646	5.020917	501	5010	0.001002179	27	0.027059
Goat milk	41.26597	48.0989	68	680	0.070733677	1.12	0.079222
Yoghurt	12.34022	14.38354	72	720	0.019977144	0.93	0.018579
Lentils peeled, raw	29.79517	34.72873	348	3480	0.00997952	2.67	0.026645
Fava Bean	0.304762	0.355225	32	320	0.001110079	3	0.00333
Beans dry, white	0.49	0.571136	343	3430	0.000166512	3	0.0005
Cowpea white raw	22.18425	25.85758	335	3350	0.007718681	1.3	0.010034
Lubia beans(Lopa Adas)	42.12926	49.10514	339	3390	0.014485291	1.3	0.018831
Maize Raw	9.655675	11.25449	371	3710	0.003033554	0.44	0.001335
Sugar	259.4765	302.4413	387	3870	0.078150208	3.2	0.250081
Tahina	3.731111	4.348918	543.5	5435	0.000800169	6.75	0.005401
Rice	31.5781	36.80688	360	3600	0.010224135	2	0.020448
Vermicelli	2.88581	3.36365	335.5	3355	0.001002578	3.05	0.003058
Banana	0.430688	0.502002	88	880	0.000570457	2	0.001141
Orange	0.006416	0.007478	26	260	2.87634E-05	4	0.000115
Guava	0.887528	1.034488	38	380	0.002722336	1.5	0.004084
Water melon	2.503549	2.918093	34	340	0.008582627	1	0.008583
Dates	0.638095	0.743753	201	2010	0.000370026	3.3	0.001221
Okra dried, raw	19.11286	22.27762	267	2670	0.008343676	12	0.100124
Eggplant	0	0	9	90	0	4	0
Cucumber	0.184765	0.215359	15	150	0.001435724	3.33	0.004781
Jews melon, raw	5.0499	5.886076	43	430	0.013688548	3.33	0.045583
Okra fresh	6.081997	7.08907	52	520	0.013632827	3.56	0.048533
Purslane raw	0.54102	0.630604	18	180	0.003503356	3.56	0.012472
Sweet Potato	2.96966	3.461384	69	690	0.005016499	2	0.010033
Potato	0.088876	0.103593	90	900	0.000115103	2	0.00023
Tomato raw	1.756418	2.047251	19	190	0.010775004	4	0.0431
Lemon	0.087937	0.102497	24	240	0.000427072	4	0.001708
Total	1973.262						1.732564

Annex 3: Engel Curve Results For Urban and Rural Areas in Rank County.

	B	SE	R Square
Urban constant	0.786	0.012***	0.303
Urban (yi/zf)	-0.55	0.28***	
Rural constant	0.820	0.016***	0.035
Rural (yi/zf)	-0.186	0.015**	

***, ** Significant at 1 % and 5 % respectively.

Annex 4: Average Actual Spending on Non-Food Items[5] for Rural and Urban Household in Rank County *(SDG/person/day)*

Item	Urban Spending		Rural Spending	
	Adjusted value (SDG/person/day)	% of the actual Spending	adjusted value (SDG/person/day)	% of the actual spending
Housing	0.27	16	0.07	14
Water	0.18	11	0.07	14
Lighting	0.08	5	0.03	5
Transportation	0.08	5	0.06	12
Education	0.18	11	0.05	9
Health	0.62	37	0.19	36
Clothes	0.22	13	0.05	8
Social contributions	0.03	2	0.01	2
Total Expenditure/person/day	1.67	100	0.53	100

[5] These values have been adjusted by using Engle curve estimates to correct for field data collected on non-food spending.