The Prevalence of Poverty and Inequality in South Sudan: The Case of Renk County[i]

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Abstract

In this study we use a comprehensive household income and expenditure survey with a sample of 245 respondents representing urban and rural households in the Renk County of South Sudan to assess the prevalence of poverty and inequality in the study area. We used the cost of basic needs; to establish both food poverty line and Poverty line; estimated poverty incidence, gap and severity; and estimated different equality measures. Major results show that 87% and 73% of the urban and rural households respectively fall below our calculated poverty lines. The estimated Gini coefficient was 18% and 20% for urban and rural households, respectively. Results of other equality measures show higher inequality between the poorest and richest segments of households as the richest quintile among urban households consumes 5 times that of the poorest, while that of the rural households consumes 4 4 folds the poorest quintile.

Keywords: FGT Measures, Inequality, Poverty, South Sudan.

JEL classification: D6, I3, P4, Q12.

1 Introduction

Prior to the secession of the Southern Sudan from the Sudan in July 2011, there were many challenges that trap the population of many areas of the country by poverty. The education, health, water and sanitation services are extremely poor as a result of the long civil conflict (1955–1972 and 1982–2005) and unfavorable climatic changes and natural disasters. Consequently, adult illiteracy rate reached 75% of total population with the primary school enrolment being only 20% (GOS-UNCT, 2004). Only 27% of the population had access to safe drinking water and only 16% had access to sanitation facilities (Guvele et al., 2009).

The Comprehensive Peace Agreement (CPA), which is signed between the Sudanese government and the Sudanese People's Liberation Army (SPLM) in 2005, brought the more than 20 years of war to an end. According to the CPA, there should be a redistribution of the country's wealth with particular focus on natural resources led by oil and that was to be implemented during the interim period of six years (2005–2011). In January 2011, the people in south have voted for secession from Sudan, and accordingly the new country of south Sudan was born.

This study's focus is on providing detailed assessment of the poverty situation in south Sudan after the signature of the CPA and prior to the secession, i.e. during the interim period (2005–2011). The data used in the analysis are collected from the Upper Nile state and the findings of the study are expected to form a base for further evaluation of the poverty situation in the pre/post secession of southern Sudan. The Upper Nile state is the fourth biggest state in the South Sudan by population with 964,353 inhabitants in 2010, which constitutes 12% of the total population in the country (SSNBS, 2010). The state has 12 counties of which the Renk County is the second biggest by population with 137,750 inhabitants, which constitutes 14.3% of the state's population. Accordingly, the Renk County is selected as a case study.

Renk County has an area of 23 thousand square kilometers and is located in the northern part of the 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, man-made dug pools (haffirs) and irrigation canals as the main sources of drinking water (Anyong, 2007).

The population of the Renk County was estimated at 137750 persons (CBS, 2009 and SSCCSE, 2009). The income earned by most of the population in the study is low and the majority of the people are involved in a subsistence economy and small

scale farming on clay and heavy loamy soils (Onak, 2005). Some of the population also relies on collecting Arabic gum and fishing (Guvele et al., 2009). Renk County has one hospital and few health centers and clinics, 38 primary schools, 8 secondary schools and 2 universities (RCAU, 2008).

2 Research Methodology
2.1 Data collection

To collect the required data for pursuing this study, household field survey that differentiates urban from rural households in the Renk County is used. A simple random technique has been used, since the respondents belong to interrelated tribes and thus portray homogeneous characteristics.

The designated sample comprises 245 households, about 1.01% of the County's population, "where the Renk County comprises 24206 households (SSNBS, 2010)". After the data collection and refinement, the clean sample became 200 respondents, of which 75 are urban and 125 were rural households. The considered households are considered representative to the county as it involves households from the major county's residential towns and villages. The Renk County is constituted of five Payams (residential towns) and large number of villages, each termed as Buma (residential village).The vast area of the county and the security situation made total population coverage almost impossible. Our sample selects 15 households from each of the five Payams and 1012 households from each of the 12 Bumasto equivalently cover the four geographical locations in the county totaling to the 75 and 125 respondents from the Payams and Bumas, respectively.

2.2 Methods of analysis

For comprehensive assessment of the poverty situation in the study area, this study employs several methods of analysis. First, it employs the cost of the daily calories intake to construct a food poverty line for the study. Second, it uses Engel Curve Equation to estimate the total poverty line. Third, it uses Distributive Analysis/Analysis Distributive (DAD) software to calculate: (1) the Foster Greer Thorbecke (FGT) measures including the poverty incidence, poverty gap and poverty severity; (2) the inequality measures including Gini Coefficient, estimation and construction of the Lorenz curve, besides). Moreover, the Quintile Dispersion Ratio (QDR) and food share were also estimated as inequality measures. A brief description of each of these methods is provided hereafter.

2.2.1 Construction of Poverty Line

Poverty line can be constructed by using one of three methods, namely the cost of basic needs (CBN), food energy intake (FEI), and subjective poverty line (SPL) (Ravallion, 1998; Haughton and Khandker, 2009).The CBN method can be used if the prices of the food bundle that is consumed by the respondents are available. Nonetheless, the method considers both food and non-food items costs. Food cost represents the cost of obtaining the adult equivalent recommended calories per person per day as specified by the international standards measures for people in the developing countries. The cost of the non-food items of housing, clothing, services, etc are then added.

The FEI method defines the poverty line which identifies the consumption expenditure or income level bundle at which a person's typical food energy intake is just sufficient to meet his/her pre-determined food energy requirement (Ravallion, 1998; Haughton and Khandker, 2009). It is commonly used an alternative to CBN, if price information is not available. The third method to construct the poverty line is the SPL, which is paraphrased by Ravallion (1998), "as asking people what minimum income level is needed just to make ends meet".

Thanks to our comprehensive survey that conducted in the study are, this paper uses the CBS method to construct the food poverty line in the Renk county of Southern Sudan. The quantities of per capita food consumption for 41 food items per week were collected and classified into eight categories (Table 1). Then the average per capita daily food consumption for the middle quintile was specified. Using the Sudan Food Composition Table (Food Research Center, 1986), the quantity of each food item actually consumed was converted into its equivalent calorific value, which was then scaled up to determine the required quantity of calories to bridge the gap for attaining the recommended per capita calories intake. Next, the food poverty line (zF) was derived by estimating the cost of the daily calories intake.

The calorific value of each food item actually consumed per adult equivalent in each household in the middle quintile has been calculated for urban and rural household in Renk County. These households were close to the poverty line as they consume the recommended calories per day according to those of Haugton and Khandaker (2009). Then, the actually consumed calories intake has been scaled-up to reach the recommended level of 2300 cal/capita/day based on FAO and others (FAO, 1996; Lutheran World Federation, 2001; Elmulthum, 2006). FAO estimated availability of

calories to vary from a low of 1760 cal/capita/day for central Africa to a high 2825 cal/capita/day for southern Africa (Wesenbeeck et al., 2009).

The scaling up is done as follows:

$$\text{Scaled - up calories}_i = \sum_{i=1}^{n=41} \frac{\text{Total recommended}}{\text{Total actually consumed}} * \textit{Actually consumed}_i$$

Where is the selected food item.

These food items are then aggregated to obtain an overall scaled-up food items.

For the purpose of this research, eight food categories consumed by households in Renk County have been identified, namely: (1) cereals and flour; (2) edible oil; (3) vegetables; (4) legumes; (5) meat and fish; (6) milk and dairy products; (7) sugar and sugar products and (8) fruits.

Table (1) provides the actual calories consumed and scaled-up calories with value for both urban and rural households in Renk County.

Table 1: Actually consumed, scaled-up and values of calories in the Renk County

	Urban				Rural			
	Actually consumed calories	% actual calories	Scaled-up calories	Value of scaled-up calories	Actually consumed calories	% actual calories	Scaled-up calories	Value of scaled-up calories (SDG)
Cereals	1341.91	62.27	1432.15	0.36	1135.13	57.53	1323.09	0.30
Edible oil	270.97	12.57	289.19	0.17	278.26	14.10	324.33	0.22
Vegetables	55.53	2.58	59.26	0.40	54.32	2.75	63.31	0.41
Legumes	105.38	4.89	112.47	0.07	94.90	4.81	110.62	0.06
Meat and fish	62.78	2.91	67.01	0.32	69.30	3.51	80.77	0.31
Milk and dairy products	72.58	3.37	77.46	0.16	73.59	3.73	85.77	0.15
Sugar and sugar products	237.45	11.02	253.42	0.21	263.21	13.34	306.79	0.26
Fruits	8.47	0.39	9.04	0.03	4.55	0.23	5.31	0.02
Total	2155.07	100.00	2300.00	1.72	1973.26	1.1	2300.00	1.73
Tea and Coffee			1.2	0.11	1.3		1.4	0.12
Grand total			1.5	1.83	1.6		1.7	1.85

Cereals and flour constituted 62% of the total consumed calories for urban and 58% for rural households. Within cereals, Sorghum accounted for most of the calories consumed. Sorghum is the main staple food crop grown as subsistence in backyards and purchased at low price from produced mechanized framing schemes in the County.

Edible oils, sugar and sugar products contributed a considerable share of the total consumed calories. Sugar consumption increased not only for its own sake but also as a complementary product to the consumption of tea and coffee. Fruits, including oranges and citruses, contributed the lowest share of calories intake because of their high transportation costs from nearby areas of Sennar and Khartoum, particularly when isolated during the rainy season.

According to the CBN method of estimation, the food poverty line was estimated at SDG1.83/person/day and 1.85/person/day for urban and rural households, respectively.

The non-food component (zNF), which is defined as the minimum per capita consumption level of non- food items that meets the minimum basic requirements of the household is also calculated and they included the following eight major items: (1) Housing: cost of renting, furniture and rehabilitation; (2) Water: cost of drinking water from various sources; (3) Lighting: cost for lighting from various sources such as electricity, candle, battery, etc...); (4) Transportation costs; (5) Education: cost for school registration, breakfast, transportation, stationeries, etc...); (6) Health fees for medical physicians' checkup, medicines, paying for treatments, laboratory testing, and transportation cost to health services center; (7) Clothes cost; and (8) Social solidarity: contribution for the occasions of death, festivals, ceremonies, etc.

According to Ravallion (1998), the estimation of the Engel Curve was used to obtain the non-food expenditure as follows:

$$W_i = \alpha + \beta \log Y_i \qquad\qquad (2)$$

Where, W_i is the budget share for food for observation i which is obtained by dividing food expenditure by the total expenditure, and Y_i is the total per capita expenditure for each individual divided by the food poverty line which was estimated on the basis of the calorie intake and the prevailing prices at the time of the data collection.

The resultant Engel curve equations for urban and rural households can be written as follows:

$$W_{iurban} = 0.786 - 0.55 \ln Y \qquad\qquad (3)$$

$$W_{irural} = 0.82 - 0.186 \ln Y \qquad\qquad (4)$$

Based on the above Engel Curve equations the lower poverty line (ZL) was calculated as follow:

$$Zl = (2 - \alpha) * Zf \qquad\qquad (5)$$

Where, α is the constant of the Engel Curve Equation and Zf is the food Poverty line.

The estimated Zl for rural and urban are:

$$Zl_{urban} = (2 - 0.786) * 1.83 = 2.22 \qquad\qquad (6)$$

$$Zl_{rural} = (2 - 0.82) * 1.85 = 2.183 \qquad\qquad (7)$$

On the other hand the upper poverty line (Zu) was calculated as follows:

$$Zu = (1 + \beta) * Zf/(\alpha + \beta) \qquad\qquad (8)$$

Where, α is the constant of the Engel Curve Equation, β is the coefficient to be estimated when calculating Engel Curve equation, and *Zf* is the food poverty line estimated on the basis of the calories intakes and the prevailing prices. Based on the above method of estimating the non-food component, the urban and rural upper poverty lines are estimated as follows:

$$Zu_{urban} = (1 - 0.55) * 1.83/(0.786 - 0.55) = 3.5 \qquad\qquad (9)$$

$$Zu_{rural} = (1 - 0.186) * 1.85/(0.82 - 0.186) = 2.38 \qquad\qquad (9)$$

The resulting upper food poverty lines for urban and rural household are then used in estimating other measures of poverty such as poverty incidence, poverty gap and poverty severity.

2.2.2 Foster Greer Thorbecke (FGT) Measures

Given the intra-group income distributions, a number of poverty indicators may be estimated. The FGT indicators after Foster et al., (1984) were used to classify households according to their poverty levels in the Renk County. These indicators measure the proportion of poor population (the head count ratio) as well as the

depth (gap ratio) and the severity (squared gap ratio) of poverty at both households' group and national levels. The FGT can be estimated as follows:

$$p^\alpha = \frac{1}{n}\sum_1^q \left[\frac{z-y}{z}\right]^\alpha \qquad (11)$$

where n is the total number of individuals under consideration, q is the total number of poor, y is the income of the ith poor individual, z is the poverty line, and α is a parameter characterizing the degree of poverty aversion i.e. the parameter α determines the precise measure of poverty to be used.

The absolute poverty line is either be assumed as exogenous, using one or two dollars of the World Bank estimates adjusted or unadjusted for purchasing power, or generated endogenously using the national basket of basic needs and the commodity prices.

a) Head Count Ratio (H)

The head count ratio measures the spread or incidence of poverty in a given society. It is defined as the percentage of the population whose daily per capita total consumption expenditure falls below the district level poverty line. It is generated when alpha (α) equals zero and is estimated as follows:

$$H = \frac{q}{n} \qquad (12)$$

b) Poverty Gap Ratio

It measures the depth of poverty, the distance separating the population from the poverty line, and is generated when the parameter alpha (α) equals one. It is estimated as follows:

$$PG = \frac{1}{n}\sum_{i=1}^q \left[\frac{z-y_i}{z}\right]^1 \qquad (13)$$

Where, PG is the poverty gap ratio, which is also denoted with P1, Y_i is the income of individual *(i)*, (often works with household rather than individuals), but are still considered as being equal.

c) Poverty Severity or Squared Poverty Gap

It measures inequality among the poor by squaring the poverty gap. It is obtained when alpha equals two as follows:

$$PS = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{z-y_i}{z}\right]^2 \qquad\qquad (14)$$

Where, PS is the poverty severity or squared poverty gap, which is also denoted with P2,

2.3 Distribution Measures

The distribution measures of poverty are 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 individuals or households are commonly arranged in ascending order according to income and divided into quintiles (fifths) or deciles (tenths). The common measure of income inequality is the ratio of income received by bottom 10% and top 10% of the population (two extremes of very poor and very rich). This can be measured by using one of four methods as follows:

The Lorenz Curve:

Lorenz Curves shows the actual quantitative relative relationship between percentage of income recipients and the percentage of the total income they received. The more Lorenz curve is away from diagonal (perfect equality) the greater the degree of inequality (Todaro, 1996).When analyzing poverty situation, it is important not only to analyze poverty incidence, depth and severity but also to measure the equity dimensions of income/food distribution in the society. Inequality is attributable to differences in per capita expenditure that exists between poorest and richest people.

The simplest way to measure inequality is by dividing the population into segments of five quintiles from poorest to richest, and to report the levels or proportions of income (or expenditure) that accrue to each level. Then cumulative distribution is calculated for the respective segments and the expenditures. When drawing the Lorenz curve the cumulative segment will be allocated to X-axis while the relative expenditure levels will plotted in the Y-axis.

a) *Gini Coefficient*

It is a convenient measure of income inequity. It is calculated as a ratio of the area between diagonal (perfect equality line) and the Lorenz curve divided by the total area of half square. If the Gini Coefficient becomes 0 it means perfect equity, when it is 1 then it means imperfect equity (Haughton and Khandker, 2009).

The two FGT measures (P1, P2), Lorenz curve and Gini coefficient are estimated 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)

b) *Quintile Dispersion Ratio (QDR)*

A simple and popular measure of inequality is the deciles dispersion ratio, which presents the ratio of the average consumption (or income) of the richest 10 percent of the population to the average consumption (or income) of the poorest 10 percent. As this ratio can also be calculated for others percentiles. In this study the Quintile Dispersion Ration (QDR) which obtained by dividing the average consumption of the richest 20 percent, first quintile, by that of the poorest 20 percent, the 5th quintile. The QDR is readily interpretable, by expressing the income of the top 20 percent (the "rich") as a multiple of that of those in the poorest quintile (the "poor") (Haughton and Khandker, 2009).

c) *Food Share*

The share of food out 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. This is also confirmed by several empirical evidences from different countries (IFAD et al., 2011).

3   Results and Discussion

Results of the different methods are shown in this section, in which the results of the food and poverty lines will be firstly discussed, then the FGT Measures results follows, and finally those of the inequality measures will be discussed.

3.1 Food and Poverty Lines

Results of the food poverty line show that they are almost similar among rural and urban households with SDG 1.85 and 1.83/person/day for the rural and urban households, respectively. On the contrary, results of the poverty line are different

with SDG 2.38 for rural and SDG 3.5 for the urban households. The latter differences are explained by the higher costs paid by urban households on non-food items.

Despite the similarity between food poverty lines for rural and urban households, the calories intake between the two exhibited a significant difference. The rural household calories intake is 1,705 Cal/person/day compared to 2,157Cal/person/day for urban households. The lower calories intake in the rural areas is explained by transportation costs that cut off rural village from urban areas especially during rainy season in the absence of paved roads. This translates into higher prices for food, which reduces people's access to food. In such a situation, rural households tend to consume low quality food as one of the coping mechanisms in the face of food shortages.

As expected, the average spending of urban households is found to be higher than that of rural households with SGD 2.63/person/day and SDG 2.24/person/day for them, respectively. It is also expected that the share of food items in the total cost of both categories is the highest as both lies in a developing community. Hence, 72% and 79% of urban and rural households' spending respectively goes to food items.

The average value spent by urban household of non-food items is SDG 0.75 per person/day compared to SDG 0.48 per person/day for rural households. The distribution of the average non-food budget among the different items is shown in Figure (1). Spending on health is the highest among all non-food items, which is justified by the wide spread of diseases, especially Malaria, Diarrhea and Trachoma and the relatively high cost of medical treatments. Transportation costs is an item that is more associated with rural households who live in remote areas and need to move frequently to access markets and health services.
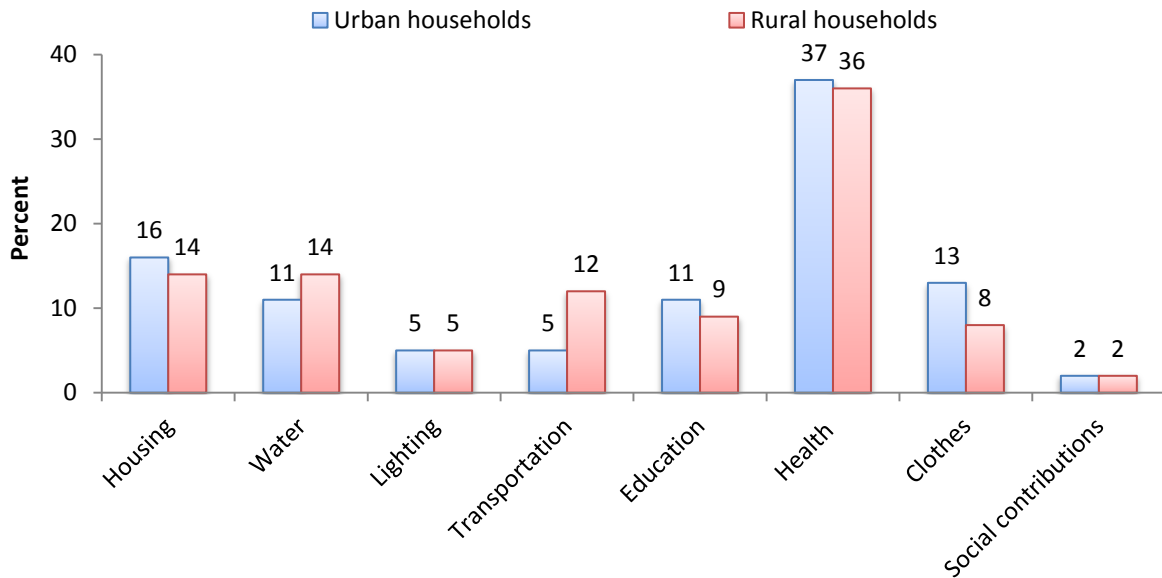
Figure 1: Structure of non-food items' spending of rural and urban households

Spending on housing represents the second highest non-food item for both urban and rural households, which is followed by spending on water despite the availability of natural water resources and the subsidy provided by government and non-government organizations, spending on water ranks among the highest in the list.

Rural households are less likely to send their children to schools than urban households, and this explains the higher share devoted to education among urban households compared to rural households. Despite the small share of the social contributions, which is a form of social solidarity, in the average non-food budget, it represents an important budget component for both payers and receivers that can't be avoided by tradition especially in the rural community.

3.2   Results of the FGT Measures

After identifying the poverty lines for rural and urban households, we calculated the FGT measures of poverty, which show poverty to prevail more in urban households with 87% compared to 73% for rural households (Figure 2) where DAD software is used in the calculation process. Poverty incidence, gap and severity are more apparent among urban households than those of the rural households, which could be explained by the high influx of Internally Displaced People (IDPs) and refugees during the civil war period and the limited employment opportunities in the County.
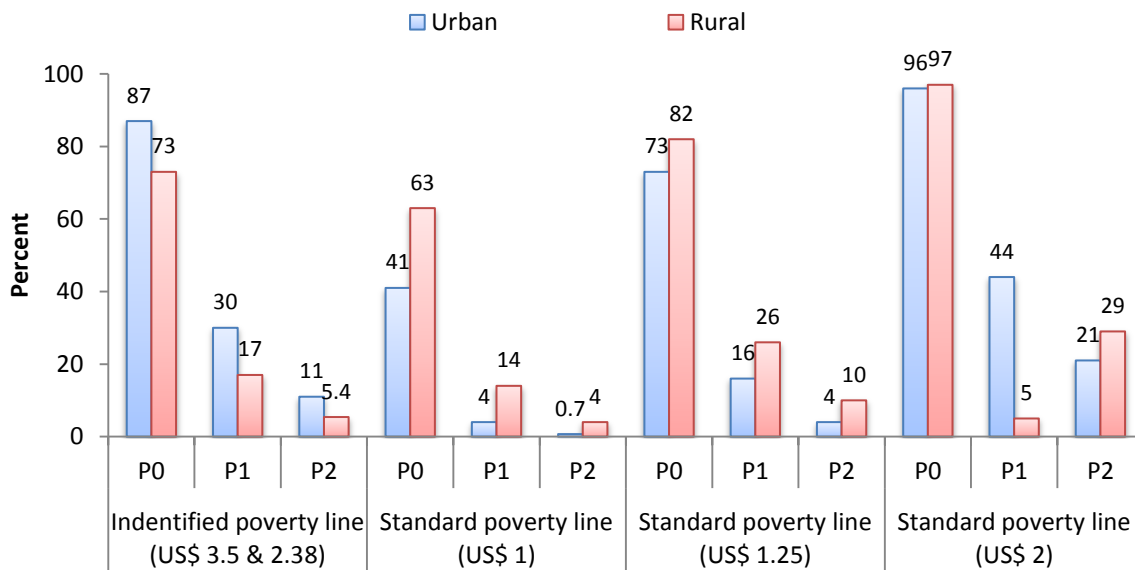
Figure 2: Poverty incidence, gap and severity in Renk County

These differences in poverty incidence between urban and rural may be explained by differences in income, failure of agricultural seasons, scarcity of off-farm generating income activities, and internal displacement of people (IDPs) migration from rural areas to the relatively safe Renk County. The IDPs had been negatively affected as they are transformed from producers in rural areas to refugees with limited income sources and high consumption demand. This also contributed to increase food and non-food prices in the urban areas of the county.

To estimate the number of people below the poverty line using the international measures of US$1, US$1.25 and US$2 have been applied, with the exchange rate being (US$ 1 = SDG 2.23) during the data collection. According to the three standard lines, poverty Incidence, gap and severity are found to be mostly higher among rural households.

Results show that, 41% of urban households' live below the poverty line if US$ 1 index is applied. This share increases to 73% and 96% should US$ 1.25 and US$ 2 lines, respectively are applied. Results of the rural households show that 63%, 82% and 97% fall below poverty lines if the three standard lines (US$ 1, 1.25 and 2), respectively are applied (Figure 2). These confirm that, the incidence of households' poverty in study area are generally high, nevertheless, due to the increasing cost of living in the country the poverty incidences in Renk County may reach 95% of the total households.

3.3 Prevalence of Inequality

Inequality is a broader concept than poverty because it considers the entire population rather than only a fraction of population that falls below a certain poverty line (Haughton and Khandker, 2009). In this study, we use four measures of inequality, namely, Quintile Dispersion Ratio (QDR), Lorenz curve, Gini Coefficient and Food share of the total expenditure. Results of the selected measure are shown hereafter.

The Quintile Dispersion Ratio (QDR) in this study is measured as the ratio of the average expenditure of the richest first quintile of the urban and rural household in the study area to that of the poorest fifth quintile. The QDR is also calculated separately for food expenditure in a similar way. Results show that, QDR on the total expenditure is slightly larger for rural (2.6) than urban (2.3) households, however, that of food expenditure is much higher for rural and urban households with 2.5 compared to 1.66 for urban households. This shows that the equality is higher within rural households considering both food and non-food expenditure.

Results on the spending of food and non-food items by the richest and poorest segments of households in the study area show the spending ratio on non-food items to be larger among urban household, while that of food items is lager among rural households.
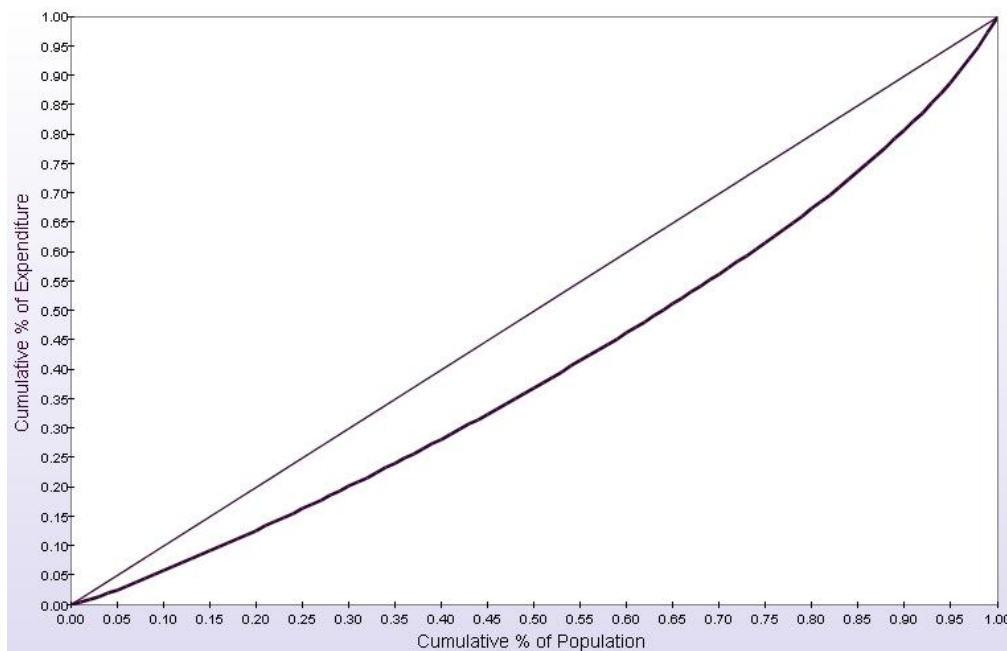
Results of the Lorenz Curve on urban households are shown in Figure (3). It illustrate that the poorest quintile among urban households consumes 8% of the total expenditure, while the top richest quintile consumes 33% of the total expenditure. That means that, the richest quintile of urban households consumes 4.7 times that of the poorest quintile.
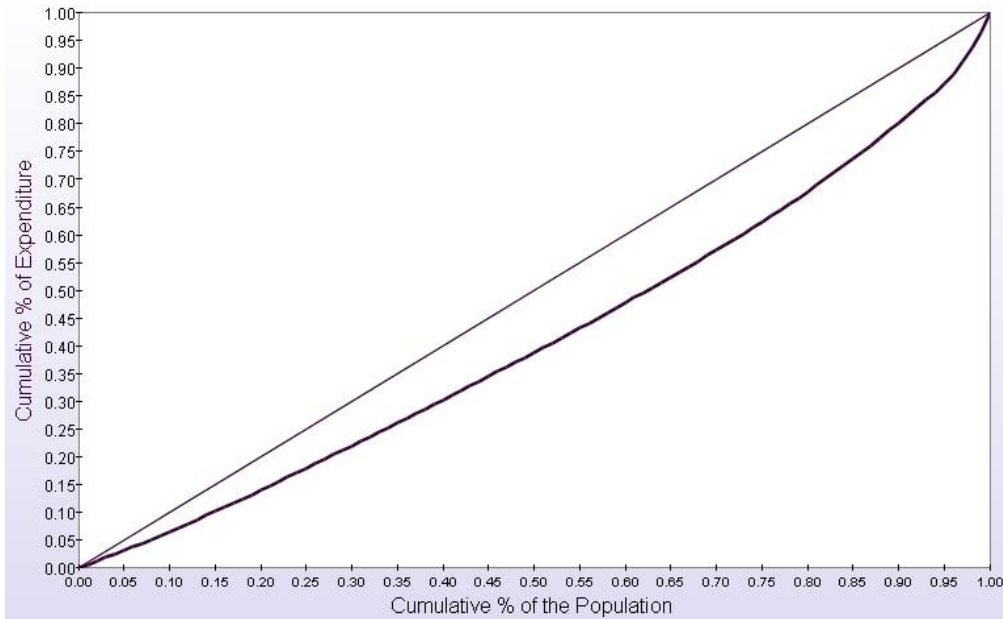
Figure 3: Urban Lorenz Curve

For rural household as depicted in Figure (4), the results of the Lorenz Curve show that the poorest quintile consumes only 8% of the total rural households' expenditure compared to 33.2% by the top richest quintile of rural households. The Lorenz Curve depicts almost similar patterns of equality distribution of spending (income) for rural and urban households in the study area. However, for both rural and urban households it shows greater discrepancy among the lower and higher segments over respective total spending (income).

Figure 4: Rural Lorenz Curve

The third measure of inequality applied in this study is Gini Coefficient, results of which show Gini coefficients of 17.6% and 19.7% for urban and rural households, respectively. These values reveal almost similar inequalities between the two households' categories. Since the two coefficients are relatively small, this implies the existence of relative inequity in the Renk County mirroring the overall poverty distribution situation of urban and rural households in the county.

The last measure of inequality applied in this study is the food share, which results are shown in Figure 5). It shows total food and nonfood expenditure as well as the food share out of total actual spending by each quintile for rural and urban households. It is clear from the figure how the share of spending on food increases as income decreases for both the urban and rural households.
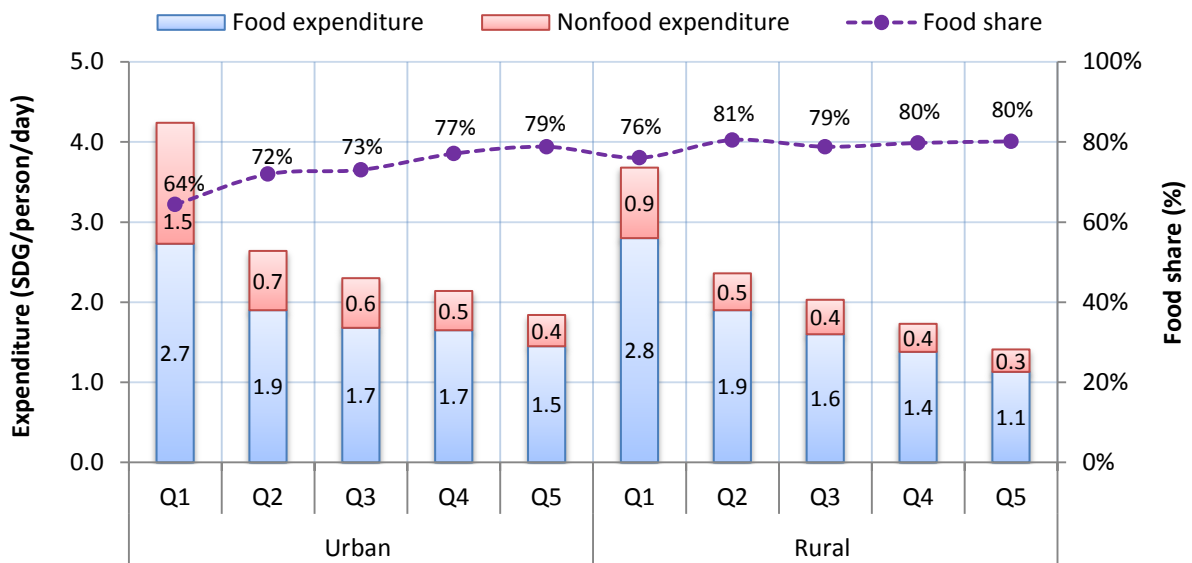
Figure 5: Urban and Rural actual total and Food Expenditure by Quintile

The food share approximates 64% for the richest quintile in the urban area compared to 76% for the richest specimen for the rural households. Shares of food in total spending increase to reach almost 80% as income level of both rural and urban households decreases. The discrepancy on the food share spending amongst the first and fifth quintiles of urban households is relatively larger compared to that of rural households.

4   Conclusions

Overall, it may be concluded that poverty in the Renk County is high in both urban and rural areas. Moreover, despite the low inequality status among the people in the County as specified by the Gini coefficient measurement, there has been certain degree of income discrepancies between the richest and the poorest segments of the two areas as depicted by the Lorenz curve and the QDR results. To alleviate poverty among the poor residents of Renk County, policy makers in the country may need to assure peoples access to "basic needs".   That could be achieved by exploring means to develop and implement complementary programs between the Agricultural Bank, International Fund for Agricultural Development (IFAD) and other relevant NGOs involved in microfinance loans and credit to outreach the poorest of the poor. Such programs could provide income generating activities for production and marketing of products such as dry fish, juice from the plenty available Dome palm trees in the County, cheese and ghee from the abundant supplies of milk during the rainy season and folklore products among women (making mats out of Dome leaves).

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