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TRANSIENT POVERTY AMONG PASTORAL HOUSEHOLDS IN THE SEMI-ARID LOWLAND OF BARINGO DISTRICT, KENYA

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***Abstract**: This study was carried out in Baringo District of Kenya to determine poverty among sedentary and semi-nomadic pastoral households. Results indicate that the sedentary agro-pastoralists tend to diversify their sources of income more than semi-nomadic pastoralists. Poverty and income inequality levels were found to be higher during the dry season than the wet season. Lorenz curves demonstrated significant income gap between the rich and the poor during the dry season than the wet season. The findings demonstrate that poverty indicators in the study area vary with respect to seasonal climatic variability. Despite relying on relatively degraded environment, sedentary agro-pastoralists were found to be almost twice wealthier than the semi-nomadic pastoralists. This is explained by the higher contribution of the climate-proof economic activities pursued by sedentary agro-pastoralists than their semi-nomadic counterparts. Diversification of livelihood activities through pursuance of off-farm activities is, therefore, imperative in unpredictable environments to ensure income and food security of pastoral households.*

***Key words:** Sedentary agro-pastoralists, semi-nomadic pastoralists, poverty indicators and seasonal climatic variability*

INTRODUCTION

The Arid and Semi-arid Lands (ASALs) of East Africa are inhabited by pastoral and agro-pastoral communities, majority of them confronted with high incidences of poverty, chronic food insecurity and, therefore, dependent on emergency relief to meet their basic needs (Scott, 2006). This situation is further worsened by the frequent and recurrent droughts which have sharply exposed the layers of poverty, underdevelopment, and political marginalization in these areas (IRIN, 2006).

Poverty in East Africa has many faces that can vary substantially across space, time and socio-economic groups. Obtaining comprehensive, disaggregated, reliable and timely indicators of poverty status across these dimensions is, therefore, a prerequisite to designing an all inclusive and effective pro-poor development agenda (RoK, 2005). Poverty status is not a static situation because people often move in and out of poverty from one time to another. This is unsurprising in East Africa, given that economies in the region mainly depend on land-based production systems that are subject to seasonality and highly variable climatic conditions. Changes in poverty status can be due to economic cycles and shocks, such as poor weather and loss of employment (Kristjanson et al., 2009). Depending on their resilience capacity, some households manage to escape poverty while others remain in poverty for extended periods of time (Suri et al., 2008).

Pastoral ecosystems in East Africa have experienced an unusual variability in climate manifested in unpredictable rainfall and drought occurrences (Tari, 2000). Consequently, the current livelihoods and resource use patterns in the dry lands are insecure and can no longer maintain the living standard of the inhabitants. Incidences of poverty, therefore, tend to be more in the dry areas than in the higher potential areas. Finding ways to improve food and nutrition security of households and alleviate poverty in the dry lands has thus become a key policy issue (Nyariki et al., 2002). Strategies to reduce the number of people directly dependent upon the primary resources of the ASALs and to improve the productivity of those resources must be sought urgently (Ngugi and Nyariki, 2005).

In order to address poverty among the pastoral and agro-pastoral communities, governments, non-governmental organizations and international agencies must understand more clearly the geo-physical, economic and cultural environments within which they live as well as their livelihood systems (Campbell, 1999). Additionally, it is imperative to know how these environments are affected and how they can be maintained in the face of the current climatic variability and change. Only in this way can realistic policies, investments and technical assistance programs be developed and implemented, as well as the latent capacity of the pastoral sector be fully realized.

The aim of this study was to determine the effect of seasonal climatic variability on household poverty status in the semi-arid rangelands of Baringo district, Kenya.

MATERIALS AND METHODS

Study area

The study was carried out in the Njemps Flats in the larger Baringo District which, falls within agro-climatic zones IV and V. The area is located between latitude 00^{o} 30' N and longitude 36^{o} 00' E in the Rift Valley province of Kenya. The Njemps Flats is classified as lower midland (LM) livestock-millet zone, which is best suited for livestock production (Herlocker et al., 1994).

The study area receives an average annual rainfall of about 500 mm and experience a hot and dry climate with an annual mean temperature above 30^{o}C (Tokida, 2001). Along with the increasing elevation, as the landscape is rising uphill from the lake, the temperature gradually declines to an annual mean of 25^{o}C. The soils in the Njemps Flats are generally shallow silt loam to clay loam, with low organic matter (Wasonga, 2009). The main sources of water in the study area are rivers Pekerra, Molo and Endao (seasonal) which drain into Lake Baringo. The vegetation is dominated by Acacia and ephemeral herbaceous species (Marangu et al., 2008).

The main land-use practice in the Njemps Flats is extensive livestock production. Sedentary agro-pastoralism is the main land-use on the west, south and eastern part the study area, while semi-nomadic pastoralism dominates on the northwestern and northern parts (de Groot et al., 1992). Livestock production provides 75% of the district's total income, with 70% of the district's population deriving its livelihood from livestock

production. Although pastoralism is the main source of livelihood in the Njemps Flats, low livestock production due to range degradation and frequent drought has led to an increasing number of households engaging in crop farming (Johansson and Svensson, 2002).

Sampling procedure

Stratified random sampling procedure was used to collect data in this study. This method involve dividing the target population into two or more sub-populations using a given criteria, after which simple random sample is taken from each sub-population. The study area was divided into two strata based on land-use system, namely, sedentary agro-pastoral land-use system (SAL) and semi-nomadic pastoral land-use system (SNL) (Wasonga, 2009). The two strata were considered to be two distinct food economies. A "food economy" as defined by Seaman et al. (2000) comprises all the households in a geographical area that obtain their food and cash income by roughly the same combination of means. A household was defined as all people who live under one roof and are subject to decisions made by the household head. A household head was defined as the owner of the main source of income or means of production in a household and, therefore, the one provides the basic needs for the household members.

A sample size of 200 randomly selected households (125 from SAL and 75 from SNL) was attained. Due to the inherent difficulties in accessing most parts of the study area, chief of them rough terrain and scattered homesteads, fewer households were interviewed under SNL than SAL. A semi-structured questionnaire was used to collect the data during the wet and the dry seasons of 2009.

Poverty Measurements

Determining an appropriate poverty line, and thus identifying those who are classified as poor, has been one of the principal methodological problems in the analysis of poverty. Various procedures have been developed based on alternative concepts of poverty. However, a common feature to all proposed methods is a significant degree of arbitrariness in the value assigned to the poverty standard. This is evident even in approaches based on subsistence needs since there is no one level of food intake required for subsistence, but rather a broad range where physical efficiency declines with a falling intake of calories and proteins (Foster and Anthony, 1988). This study, therefore, combined the food energy intake and the cost of basic needs approaches to establish the poverty line.

The P-alpha equations also referred to as Foster-Greer and Thorbecke (FGT) developed by Foster-Greer and Thorbecke (1988) were used to assess poverty incidence, gap and severity. Poverty analyses were done to compare the status within and between sedentary agro-pastoral land-use system (SAL) and semi-nomadic pastoral land-use system (SNL). The P-alpha takes three forms to measure poverty incidence, gap index and severity. The following P-alpha equation was used to estimate poverty:

$$PG_{\alpha} = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^{\alpha}$$

Where z is the poverty line, q is the number of households or persons below poverty line, N is the sample population, y_i is the income of the ith household, and α is the FGT parameter, which takes the values 0, 1 and 2, depending on the degree of concern about poverty. The first measure is the head count index (P_0), which is the percentage of the population in families living below the poverty line. The head count index was estimated using the following equation by:

$$P_0 = \frac{1}{N}q = \frac{q}{N} = H$$

Where P is the FGT parameter, q is the number of households or persons below poverty line, N is the sample population and H is the head-count ratio. This index measures the incidence of poverty (Nyariki and Wiggins, 1997).

The second measure is the poverty-gap index (P_1), defined by the mean distance below the poverty line, which is expressed as a proportion of the poverty line, where the mean is obtained from the entire population and considers the non-poor as having zero poverty gap (Jolliffe, 2003). Poverty gap index was calculated using the following formula:

$$PG_1 = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)$$

The third measure is the squared poverty-gap index (P_2), defined as the mean of the squared proportionate poverty gaps (Jolliffe, 2003). The income gap squared index allows for more concern about the poorest of the poor by attaching greater weight to the poverty of the poorest than to that of those just below the line. This is done by squaring the income gap to capture the severity of poverty. In other words, this measures the severity of poverty even more accurately (Eissa, 2009). The FGT is given by the following formula:

$$PG_2 = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^2$$

This index satisfies the Sen-Transfer axiom, which requires that when income is transferred from a poor to a poorer person, the measure of poverty decreases.

The study used the Lorenz curve and Gini coefficient to measure and analyzes the income inequality among households in the pastoral communities and between seasons. On the Lorenz curve, the cumulative proportion of population is presented on the horizontal axis and the corresponding cumulative proportion of income on the vertical axis. When income is equally distributed among the populations, the Lorenz curve corresponds to the diagonal line or 45 degrees line. This reflects the line of perfect equality, otherwise the Lorenz curve is a convex curve and, the degree of convexity is higher when inequality is higher (Eissa, 2009). The Gini coefficient was calculated using the following formula:

$$G = 1 + \left(\frac{1}{q}\right) - \left(\frac{2}{q^2 z}\right)\sum_{i=1}^{q}(q + 1 - i)y_i$$

Where G is the Gini coefficient of income distribution among households, q is the number of poor households (those falling below the poverty line), z is the mean income of the poor households and y_i is the income of the ith household. Using this measure, when the value of G is 0, there is perfect equality. Otherwise value 1 implies mean perfect inequality (Nyariki and Wiggins, 1997).

The study also used Sen Measure. Sen (1976) formulated two desirable properties of poverty indices: the monotonicity axiom, which requires a rise in the overall poverty level if the income of a poor person is reduced; and the transfer axiom, which demands an increase in poverty whenever, a pure transfer is made from a poor person to someone with more income. The head-count ratio, H (the fraction of the population in poverty) fails to meet either of these requirements. The transfer axiom is also seen to be violated by the income gap ratio, indicating the average proportional income shortfall of the poor from the poverty line

(Shorrocks, 1995). The Sen's index was estimated using the formula by (Nyariki and Wiggins, 1997):

$$S = h\left[1 - \frac{z}{p}(1 - G)\right]$$

Where S is Sen's measure, h is the head-count ratio, z is the mean income of the poor household, p is the value of the poverty line and G is the Gini coefficient of income distribution.

RESULTS AND DISCUSSION

Household characterisation

The sedentary agro-pastoralists were found to be more educated than the semi-nomadic pastoralists. About 34.4%, 12.8% and 15.2% of household heads under sedentary agro-pastoral land-use system had attained primary, secondary and post-secondary education, respectively, compared with 24%, 14.7% and 10.7% under the semi-nomadic pastoral land use system (Figure 1).

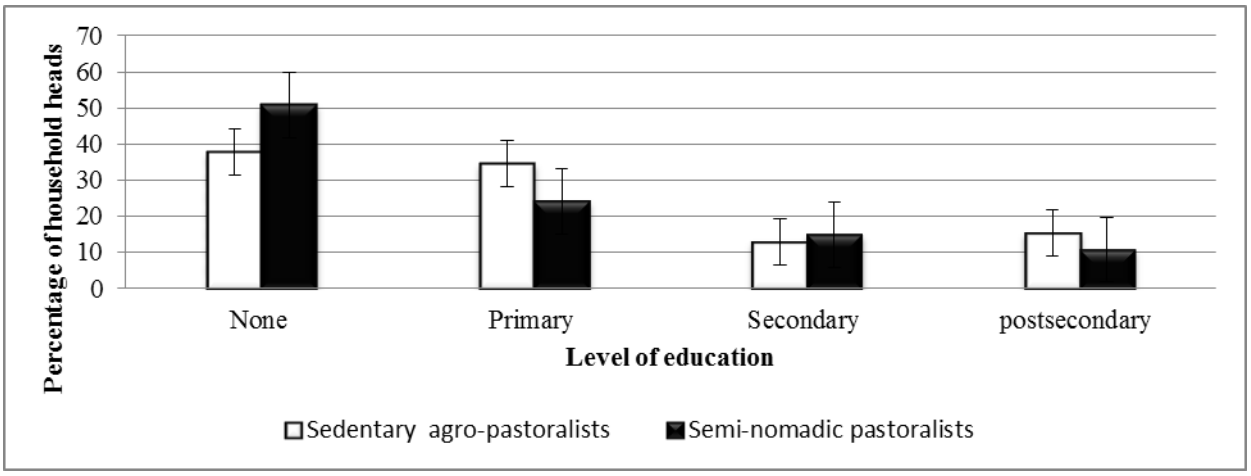

Figure 1: Education level of household heads

The results presented in Figure 2 show that the majority of the respondents, 66.4% and 72% in SAL and SNL, respectively, were in the category of 30-60 years. The respondents under 30 years comprised 16.8% of the sedentary agro-pastoralists and 12% of the semi-nomadic pastoralists, while those over 60 years constituted 16.8% and 16% of the sedentary agro-pastoralists and semi-nomadic pastoralists, respectively.

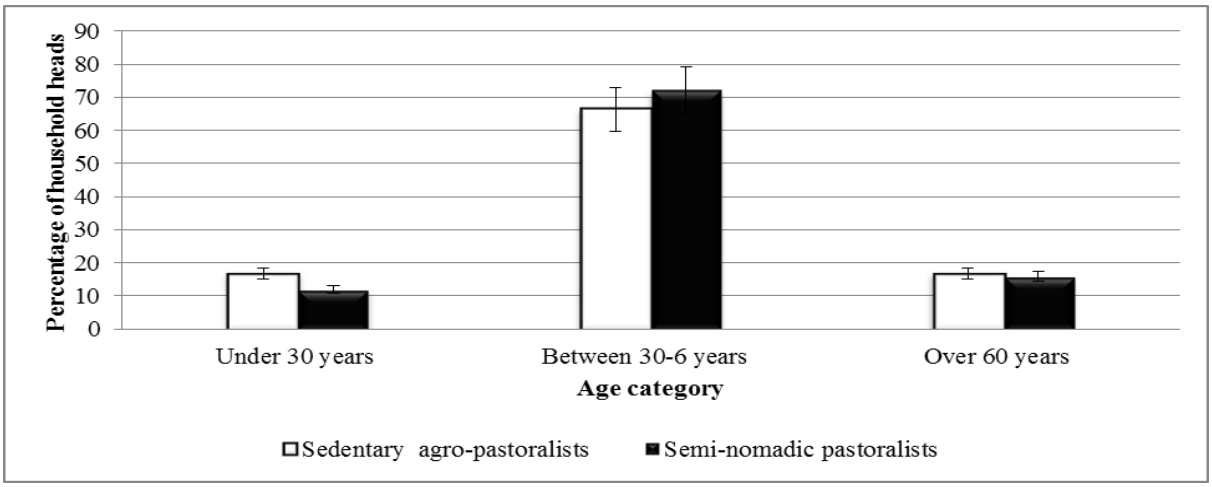

Figure 2: Age categories of household heads

Livelihood activities in the study area

Table 1 shows various sources of livelihood among the sedentary agro-pastoralists and semi-nomadic pastoralists, during wet and dry seasons. The results show that while livestock was the highest contributor to semi-nomadic households' income, crops contributed the highest proportion of the income of the sedentary agro-pastoralists. Livestock contributed 24.9% and 62% of the total income, during wet season, under SAL and SNL respectively. This decreased to 21.9% and 45.9% of the total income during the dry season for SAL and SNL, respectively. The contribution of crop production to the total household income followed the same trend during the dry season.

Table 1: Contribution of livelihood activities to household income

Livelihood activity	Sedentary agro-pastoralist households				Semi-nomadic pastoralist households			
	Wet season		Dry season		Wet season		Dry season	
	Income (Ksh)	%	Income (Ksh)	%	Income (Ksh)	%	Income (Ksh)	%
Livestock production	12068.4 (990.7)	24.9	6346.4 (631.6)	21.9	21660.7 (263.3)	62.6	12664.7 (164.3)	45.9
Crop cultivation	19813.4 (221.4)	40.8	3556.0 (713.4)	12.2	646.7 (326.0)	1.9	486.7 (301.2)	1.8
Bee keeping	1220.3 (239.0)	2.6	548.5 (216.3)	1.9	5289.3 (357.2)	15.3	4384.0 (448.8)	15.9
Charcoal burning	1617.9 (334.3)	3.3	5531.6 (167.0)	19.0	1378.7 (374.2)	4.0	2899.3 (633.2)	10.5
Trade/business	7416.0 (1868.2)	15.3	6558.4 (126.4)	22.6	4574.7 (981.7)	13.2	5896.9 (1397.3)	21.4
Wage employment	6376.0 (1328.6)	13.1	6500 (138.6)	22.4	1039.9 (1565.6)	3.0	1252.7 (1355.7)	4.5

Numbers in brackets are the standard errors

The contribution of off-farm activities such as bee keeping, charcoal production, trade and wage employment varied between SAL and SNL during the wet and dry seasons. However, their contributions were more significant under SAL and during the dry than the wet season. Trade (22.6%) and wage employment (22.4%) contributed more than any other activity during the dry season under SAL. Under SNL, trade made the second highest (21.4%) contribution during the dry season. The off-farm activities contribute more to the household income during the dry season than the wet season because they are less affected by climatic fluctuations. The dry season is usually associated with water stress which leads to a decrease in income from land-based production systems such as crop and livestock production. This makes semi-nomadic pastoralists more vulnerable to climate variability as they depend more on livestock than other economic activities.

In general, off-farm activities have the potential of cushioning pastoralists from the adverse effects of droughts or prolonged dry seasons on livestock production. Access to a wide portfolio of livelihood activities is beneficial for households living in risky environments because it reduces the chances of income failure by spreading the risk across different economic activities. As observed by Ngugi and Nyariki (2005), the more a household is engaged in activities which show no correlation amongst themselves, the more successful it is at averting income failure and food insecurity.

Poverty analysis

The per capita daily income was used as a proxy for poverty level assessment. Table 2 shows that poverty incidence in the study area was higher (89.5%) during the dry season than the wet season (77.5%). Poverty incidence among the households in SAL and SNL varied with season. As indicated in Table 2, 70.4% of households under SAL were poor during the wet season. This increased slightly to 87.2% during the dry season. This is partly explained by the fact that sedentary agro-pastoralists, though known to pursue more than one livelihood activity, in some instances, these alternatives may not be productive and sustainable enough to cushion them from the effects of dry spells. The number of poor household under SNL showed a similar pattern. However, more (93.9%) households were poor during the dry season than in the wet season (89.3%), an indication that households in the SNL are poorer than their SAL counterparts. The same finding was reached by Dercon and Krishnan (2002), the study concluded that there is a high and significant variability on poverty indicators between seasons.

Table 2: Poverty incidence in the study area

Season	SAL (N= 125)		SNL (N= 75)		Study area (N=200)	
	Poor %	Not Poor %	Poor %	Not Poor %	Poor %	Not Poor %
Wet (N=200)	70.4	29.6	89.3	10.7	77.5	22.5
Dry (N=200)	87.2	12.8	93.9	6.7	89.5	10.5

Poverty gap and severity under SAL were found to be higher during the dry season than wet season with the gap being wider (59.5%) during the dry season than in the wet season (37.5%). A similar trend in poverty gap and severity was observed under SNL (Table 3).

Table 3: Poverty and income inequality in the study area

Land use system	Seasons	Poverty line in (Ksh.)	Poverty incidence (%)	Poverty gap (%)	Poverty severity (%)	Gini coefficient	Sen's measure (%)
SAL	Wet	86.21	70.4	37.5	24.5	0.48	47.5
	Dry	102.9	87.1	59.5	44.6	0.49	69.6
SNL	Wet	86.21	88.3	49.7	32.6	0.37	61.4
	Dry	102.9	89.0	61.9	46.5	0.45	70.8

Income inequality in the study area was higher during the dry season than the wet season. Under SAL, the Gini coefficient was higher during the dry season (0.49) than the wet season (0.48). The same trend in income inequality was observed under SNL. Similarly, the Sen's measure showed that the poverty status of households generally worsened during the dry season.

Figure 3 illustrates the distribution of income in the study area during wet and dry seasons using the Lorenz curve. The Lorenz curve shows the gap between bserved and expected distribution of income during the wet and dry season to be different. The gap was found to be bigger during the dry season (0.44) than in the wet season (0.43), suggesting lower inequality and welfare among households during the wet season than the dry season.

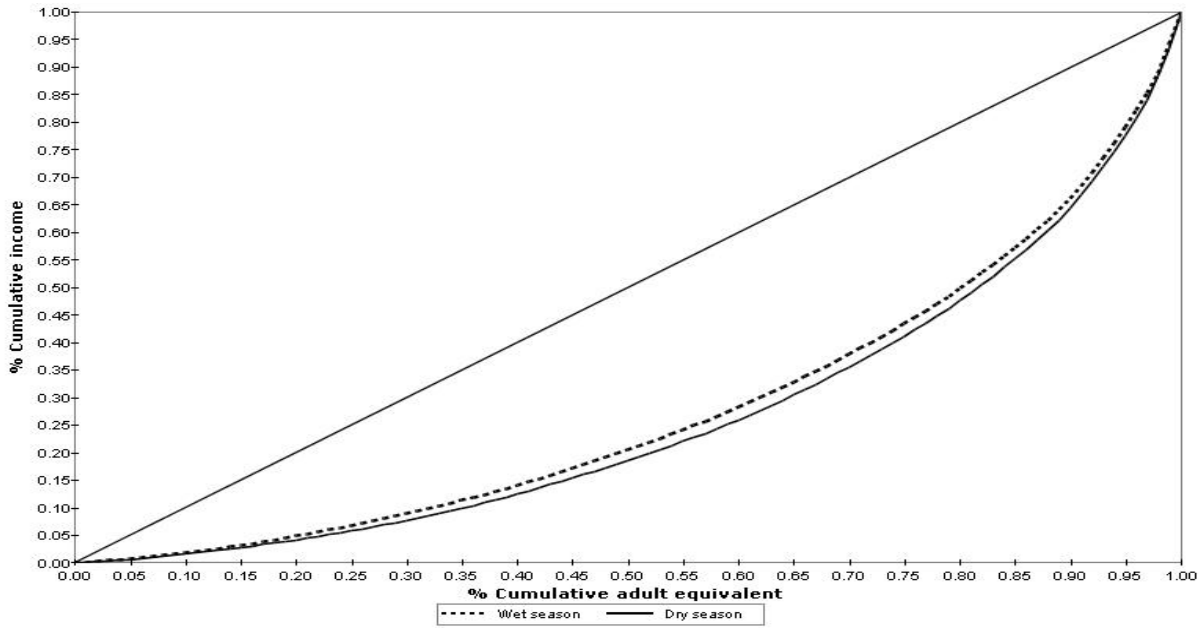

Figure 3: Lorenz curves for the wet and dry seasons

The poverty analysis reveals that households under SNL are poorer than their counterparts under SAL. This corroborates the findings of Wasonga (2009) who reported a high poverty level among semi-nomadic pastoralists compared to sedentary agro-pastoralist in the same study area. The evidence that sedentary agro-pastoral households derive large proportions of their incomes from off-farm activities may explain why they are less prone to poverty than the semi-nomadic pastoral households. This suggests that the difference in

poverty status between the households under SAL and SNL is due to the differences in level and nature of differential contribution of various economic activities to their incomes.

CONCLUSIONS AND RECOMMENDATIONS

Pastoral households in the drylands diversify their sources of income to reduce the chances of income failure by engaging in activities that confront different risk profiles. They achieve this by utilizing the available resources for different economic activities such as cultivation of crops, charcoal production, trade and wage employment. These alternative activities ensure improved livelihoods through increased incomes, food security, and thus reduce poverty levels among households. It is, therefore, likely that households with fewer alternative livelihood options fall into chronic poverty.

The higher poverty level in the dry season than the wet season is mostly the consequence of overreliance on activities that are rainfall dependent and therefore prone to climatic variability. It is evident that climate-proof activities such as trade, wage employment and charcoal production contribute significantly to sedentary agro-pastoralists' income. This makes them less vulnerable to poverty in the dry season. The off-farm activities are, therefore, critical in alleviating poverty and may provide pathway out of widespread deprivation in the pastoral areas. However, any efforts that aim to reduce or eradicate poverty in the Njemps Flats must consider seasonal variability at its core and focus on supporting alternative economic activities.

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