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Research Paper

Rate analysis of the Multidimensional Poverty Index and the level of development of farmers in the Bamanga and Kole sectors, Banalia Territory in Tshopo Province, DR Congo

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Abstract
The aim of this study was to identify the set of key variables explaining the formation of multidimensional poverty among farmers in the Banalia territory. The survey results showed that :
– Across two sectors, 89.9% of farmers were identified as poor, and deprived of an average of 45.86% of indicators. Poor people suffer 41.23% of the total deprivations that would be suffered if all households were deprived in all dimensions that the territory of Banalia could suffer;
– In the territory of Banalia, more precessent in the sectors of (Bamanga and Kole) the level of development is low, with a value of 0.3.
Key words: Analysis, poverty, farmer development, Banalia.

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I. Introduction

Several studies have tackled the issue of monetary and non-monetary poverty in the Democratic Republic of Congo, but few address the analysis of poverty among farmers in rural areas.According to a report published by Djibuti's Ministry of Finance in 2012, the monetary poverty index is rising steadily, from an estimated 45.1% in 1996 to 74% in 2012. This endemic poverty was engendered by the 1994 civil war, but also by the region's overwhelming drought.

Hamadou (2012) carried out a study on multidimensional poverty in Senegal, the results of which show that more than 70% of the population is multidimensionally poor, and that the average poor person suffers more than 39% deprivation.And the poor bear around 28% of all possible deprivations.

Nearly 80% of the Congolese population lives in rural areas, where agriculture, fishing and livestock breeding are the main activities. Agriculture represents an important income-generating sector. Although the pace of agricultural work generally depends on the autonomy and personal organization of each farmer, this profession nevertheless requires a great deal of willpower and physical strength, and can sometimes be too demanding, given that the farmer is sometimes asked to work even at weekends, while sometimes calling on the methods of his family. Despite all this hard work, farming households continue to live in a situation akin to extreme poverty (Moummi, 2012).

The July 2006, Growth and Poverty Reduction Strategy Paper (GPRSP) shows the overall incidence of poverty in the DRC.For the country as a whole, the incidence of poverty found was 71.34%. This value is very high when compared with that prevailing in other Central African countries.The same applies to the depth and security of poverty, which are respectively 32.2% and 18% (INS, 2006).

Kalombo (2010), looking at the multidimensional analysis of poverty using the data analysis approach in the city of Kinshasa, came to several conclusions, the main one being that the multidimensional approach to poverty is the best, since it takes into account several indicators of well-being.In his view, any anti-poverty policy based on the monetary approach alone is unlikely to be effective.

However, the non-existence of economic and statistical studies in this field, necessary for political decision-making by the country's highest authorities, is a major challenge.In addition, after 2015, the adoption

of the Sustainable Development Goals (SDGs), including the eradication of extreme poverty by 2030 requires a solid understanding of poverty.In particular, this involves effective use of data, but also the use of a multidimensional measurement methodology that can help galvanize committed development efforts.

The aim of this study is to identify the set of key variables that best explain the formation of the multidimensional poverty status of farmers in the Banalia territory.

The aim of this study is to verify the hypotheses according to which the rate of multidimensional poverty among farmers is more than 75% higher than among other socio-professional strata, and that their standard of living is low.

II. Material and methods

Study environment

The present study was carried out in the Banalia territory, more specifically in the Bamanga and Kole sectors. These two sectors are located in the territory of Banalia, Tshopo Province, in the Democratic Republic of Congo (DRC).

Figure1.Administrative map of the Banalia territory

Methods

Equipment used

To carry out our survey, we used the following equipment:

– An android smartphone equipped with the ODK application from the Kobotoolbox platform for data collection;
– Computer equipped with R software for data analysis and results production;
– A notepad to record more pertinent explanations not included in the questionnaire;
– Motorbike for fieldwork.

Sampling and survey proper

To achieve the objective of this study, a sample was determined through a reasoned selection based on the following two criteria:

– Be a farmer operating in the survey area;
– To have been farming for at least five years.
– Based on these two selection criteria, we drew up a sample size of 100 farms per sector.

Specification of variables

For the purposes of this study, the following variables have been selected to help us assess farmers' multidimensional poverty. These variables include :

– Qualitative variables: gender, level of education, occupation, marital status, access to health care, access to children's education,
– Quantitative variables: age of household head, household size, income, life expectancy, length of education, Human Development Index (HDI).

Figure 2: Household head survey

Data analysis

To determine the multidimensional poverty index (MPI), we assigned each variable a score of 1 point.In other words, the maximum score for all variables in the three dimensions of the MPI is 10, including two (2) for the education dimension, two (2) for health and six (6) for living conditions.

Table 1. Dimensions and assessment score

Dimension	Score
Education	2
Adult literacy	1
School attendance	1
Health	2
Alimentation	1
Deaths	1
Living conditions	6
Access to electricity	1
Access to drinking water	1
Sanitation	1
Clay floor in the house	1
Cooking fuel	1
Asset ownership	1
Total dimension	**10**

To identify households in multidimensional poverty, we summed the deprivations of each household to obtain the level of deprivation per household. The threshold value is 33.3%, corresponding to one-third of the weighted indicators. It is used to distinguish between the poor and the non-poor.

A household whose deprivation level is :

– Equal to or greater than 33.3%, the household is multidimensionally "poor";

– Between 20 and 33.3%, the household is vulnerable to multidimensional poverty or is at risk of falling into this situation one day;

– Greater than or equal to 50%, the household is in a situation of severe multidimensional poverty;

– Less than 20%, the household is not multidimensionally poor.

To determine the Human Development Index (HDI), we use the following formula.

IDH = $\sqrt[3]{\text{Ivie} + \text{Iéduc} + \text{Irev}}$ (Mokili, 2021)

Where IVie, Iéduc and IRev are respectively the indices of longevity, level of education and level of income.

$\boldsymbol{Ivie}=\frac{Vr-Vmin}{Vmax-Vmin}$

Vr : actual value :

Vmin: minimum value: (20 years)

Vmax: maximum value: (83.4 years)

Iéduc = $\sqrt{(\mathbf{Idms} \,.\, \mathbf{Idas})/\mathbf{Iced}}$

WhereIdms: Index of average length of schooling: maximum value equal to 13.1 and minimum value equal to 0;

Idas: Index of expected duration of schooling: maximum value equal to 18 and minimum value equal to 0;

Iced: Combined education index (= 0.978).

Income index (IR)

IR = $\frac{Ln(reel\ revenue)-Ln\ (minum\ revenu)}{Ln\ (\max\ \ revenu\ )-\text{Ln(mini revenu)}}$

The maximum value is equal to $107721 and the minimum value is $100.

Our data are analyzed at the 5% (0.05) significance level. Nevertheless, we have also tried to look at other levels of significance:

– $p < 0.05$: statistically significant difference, noted as "*" ;

– $p < 0.01$: statistically highly significant difference, denoted "**";

– $p < 0.001$: statistically highly significant difference, denoted "***" ;

– $p \geq 0.05$: no statistically significant difference, denoted "#".

With p-value **(p)** is the critical probability.

III. Results

In this section, we present the results of our research based on the selected variables.

Extent of poverty, Incidence and multidimensional poverty index

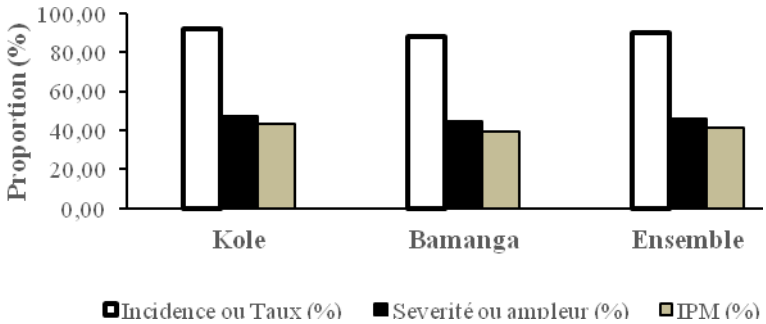

Figure 3: Poverty index, severity and MPI of our respondents

According to the results in Figure 3, 87.82% of people live in poverty in the Bamanga sector, while in the Kole sector this proportion rises to 92.10%.As for households identified as poor, they are private on average in 44.46% and 47% of indicators in the Bamanga and Kole sectors respectively. Furthermore, the calculated Multidimensional Poverty Index (MPI) reveals that multidimensionally poor people suffer 39.17% and 43.29% of total deprivation in the Bamanga and Kole sectors respectively.

Overall, we note that 89.9% of households are identified as poor and deprived of an average of 45.86% of indicators. Poor people suffer 41.23% of the total deprivations that would be suffered if all households were deprived in all the dimensions that the Banalia territory might experience.

Table 2.Contribution of indicators to the formation of multidimensional poverty

Indicators	**Bamanga**		**Kole**		Set	
	MA (%)	**MNA (%)**	**MA (%)**	**MNA (%)**	**MA (%)**	**MNA (%)**
Education	27	73	47	53	37	63
Adult literacy	20	80	28	72	24	76
School attendance	25	75	29	71	27	73
Health	24	76	24	76	24	76
Power supply	20	80	22	78	21	79
Deaths	10	90	11	89	10,5	89,5
Living conditions	100	0	100	0	100	0
Access to electricity	100	0	100	0	100	0
Access to drinking water	100	0	100	0	100	0
Sanitation	100	0	100	0	100	0
Clay floor in the house	94	6	92	8	93	7
Cooking fuel	100	0	100	0	100	0
Asset ownership	85	15	81	19	83	17

MA: Affected Household; MNA: Unaffected Household.

Table 2 shows that in both sectors, 37% of households have no one in their household who has completed five years of schooling. What's more, 24% of these households have at least one school-age child not attending school.

With regard to health and living conditions, it is observed that 21% of households have at least one person suffering from malnutrition, and 10% of households have experienced the death of one or more of their children. It is also noted that not all households have access to electricity, drinking water or public sanitation. They use charcoal and dung as cooking fuel. What's more, over 82% of households build their homes from mud, and have no equipment such as radios, televisions or cars.

On the basis of these results, we can see that living conditions indicators contribute more to the formation of poverty among farmers than indicators of other dimensions in the two sectors as a whole.

Table 3. Human Development Index score

Sectors	**Income index**	**Education index**	**Longevity index**	
Bamanga	0,03	0,50	0,43	0,32
Kole	0,02	0,42	0,38	0,28
Ensemble	0,025	0,46	0,4	0,3

The results in Table 3 show that, for the Bamanga sector, the income dimension index is 0.03, the education index is 0.50 and the longevity index is 0.43. For the Kole sector, the income index is 0.02, the education index is 0.42 and the longevity index is 0.38.For the Kole sector, the income index is 0.02, the education index is 0.42 and the longevity index is 0.38. The values of these 3 dimensions enabled us to find the value of the Human Development Index, which is 0.32 for the Bamanga sector and 0.28 for the Kole sector.
For both sectors as a whole, the Human Development Index is 0.3. This indicates a low level of development in this area.

Table 4. Health-related issues

HEALTH		Secteur		
		BAMANGA (%)	KOLE (%)	Set (%)
In the event of illness in your household, who is your first port of call?	Self-medication	6	12	9
	Health center consultation	61	57	59
	Prayer with the Priest or Pastor	1	2	1,5
	Conventional treatment	32	29	30,5

In the light of Table 4, we can see that, in the Bamanga sector, 61% of our respondents use health centers when they are ill, while 32% use traditional treatments, 6% self-medication and only 1% prayer to the pastor.In the Kole sector, 57% of our respondents use health centers, 29% traditional treatments, 12% self-medication and only 2% prayer to the pastor.
In these two sectors as a whole, 59% of our surveyed households use health center consultations, 30.% use traditional treatments, 9% use self-medication and finally only 1.5% use prayer with a priest or pastor.

Table 5.Household income

Types of expenditure	Bamanga		Kole		Set	
	(FC)	($)	(FC)	($)	(FC)	($)
Food	145700	63,3	157150	68,3	151425	65,8
Clothing	26580	11,5	31500	13,6	29040	12,55
Health care	24770	10,7	29940	13	27355	11,85
Transport and communication	15300	6,6	7200	3,1	11250	4,85
Education	21245	9,2	17200	7,4	11223	8,35
Rent	0	0	0	0	0	0
Water	0	0	0	0	0	0
Energy and electricity (fuel, torch, wood battery panels, charcoal)	17530	7,6	13798	5,99	15664	6,8
Telecommunications (Telephone and Internet)	12080	5,25	11575	5,0	11827,5	5,125
Leisure and entertainment	16930	7,3	16300	7	16615	6,65
Total	280135	121,7	268368	116,6	274251,5	119,15

Table 5 shows that the average monthly household expenditure is 280135 FC or $121.7 in the Bamanga sector.However, in the Kole sector, it is 268368 FC or $116.6. These figures represent average household incomes in the two sectors studied, based on their average monthly expenditure.
Taking into account average monthly household expenditure, we can conclude that the average monthly household income across the two territories is 274251.5 FC or $119.15.These results indicate that the majority of individuals live on less than a dollar a day, revealing that farmers in both areas are in a very precarious situation.

Table 6.Relationship between socio-demographic profile and poverty

Table 6 presents the results relating the poverty situation to the socio-demographic profile of households, including marital status, secondary occupation, age group, ethnicity and household size, as well as the results of the Chi-square test of independence and Cramer's V coefficient.

Socio-demographic profile		Poverty situation		Chi-square test	Cramer's V coefficient
		Non	**Oui**		
Age range	20 to 30 years	1	17		
	31 to 40 years	5,5	19,5	X-squared = 1.1646, df = 4, p-value = 0.8839	0.076
	41 to 50 years	3	25		
	51 to 60 years	2,5	16,5		
	More 60 years	0	10		
	Total	**12**	**88**		
Civil status	Single	0,5	10,5	X-squared = 3.1263, df = 3, p-value = 0.3726	0.125
	Divorced	1,5	2,5		
	Married	8,5	61,5		
	Widowed	1,5	13,5		
	Total	**12**	**88**		
Household size	< à 5 people	4	19	X-squared = 1.8872, df = 2, p-value = 0.003892	0.297
	5 à 10 people	3	23		
	> à 10 people	5	46		
	Total	**12**	**88**		
Education level	Illiterate	1	20	X-squared = 6.5754, df = 3, p-value = 0.04674	0.181
	Primary	3,5	29,5		
	Secondary	7	35		
	University	0,5	3,5		
	Total	**12**	**88**		
Ethnicity	Boa	7	53		
	Lokele	0	1	X-squared = 26,102, df = 11, p-value = 0,006267	0.361
	Luba	0	1		
	Manga	1	4		
	Mbesa	1	0		
	Nande	0,5	1,5		
	Ngelema	2	18		
	Tetela	0	5		
	Turumbu	0,5	4,5		
	Total	**12**	**88**		
Secondary activities	Hunting	1	5	X-squared = 8.8169, df = 11, p-value = 0.006388	0.21
	Trade	2,5	13,5		
	Digger	1	6		
	Breeding	1	5		
	Hotels	0,5	0,5		
	Nothing	3	47		
	Prostitution	0,5	1,5		
	Catering	0	1		
	Motorcycle cab	0,5	2,5		

Salaried employment	2	6
Total	**12**	**88**

Analysis of Table 4 shows that over half of poor households are made up of elderly people, while at least 35% are young people.In addition, the households studied show diversity in terms of marital status.Over 60% of poor households are married, while 13.5% and 10.5% are widowed and single respectively.

The table also reveals that the majority of poor households are larger than 10 people.Those with between 5 and 10 people are in second place, and those with at least 5 people are in last place.

In terms of level of education, at least 34% of poor households have completed secondary school, 29.5% have primary education and 20% are illiterate.

In terms of ethnicity, over half of the indigenous people (boa) were found to be poor, while 18% of the Ngelema were poor and less than 15% of other ethnic groups were also poor in the study area.

The results of the Chi-square test of independence reveal that multidimensional poverty is linked with secondary activities, ethnicity, household size and the level of education of household heads*(p-value* 0.05). Furthermore, Cramer's V coefficients show that this link is strong (0.180V0.360) between poverty and some socio-demographic profile parameters of household heads. However, poverty is not a function of the age and marital status of household heads (p-value 0.05).Cramer's V coefficients calculated for this purpose show that the link is weak (0.045V0.090).

IV. Discussion

Our discussion is based on our two hypotheses. With regard to our first hypothesis, the results showed that :

Our results show that the number of poor farmer households in the sectors is 89.9%.These figures confirm the information found by our predecessors, who concluded that poverty is essentially rural in DR Congo. Households in urban areas have a greater set of assets, so they are less vulnerable to shocks and more able to pursue a better life than their rural counterparts.

This headcount of the poor population in our study area (89.9%) is similar to that found by Furaha, Mastaki and Lebaillt (2017) in the Kabare territory (80%) in South Kivu Province, DR Congo; as well as that of Mathunado *et al* . (2019) in the Birambizo health zone, North Kivu.

The results of our study differ from the report published by Djibuti's Ministry of Finance in 2012, which shows that the monetary poverty index continues to rise, from an estimated 45.1% in 1996 to 74% in 2012. This endemic poverty was engendered by the civil war of 1994, but also by an overwhelming drought in the region.

Our poverty rate or incidence is still far higher than that of developed countries like the United States of America, which had a poverty incidence of 11.6% in 2018 and 10.5 in 2019 before the COVID19 pandemic, and 20% for the state of Mississippi after the pandemic. And currently, in 2023, the incidence of poverty is 12.4%.

Comparing the results of our study with the July 2006 Growth and Poverty Reduction Strategy Paper (GPRSP) shows that the overall incidence of poverty in the DRC.For the country as a whole, the incidence of poverty found was 71.34%. Taking these elements together, we can easily observe a discrepancy between the value found by this study and that of INS (2006). This discrepancy can be justified by the fact that INS (2006) had taken into account the values found nationwide in both urban and rural areas, but our study only focused on areas where the poverty situation remains critical. This value is slightly lower than our research figure of 89.9%.

Also a study was conducted by Okiyewass in 2017 entitled "Multidimensional analysis of poverty: the case of Djibouti" him in his study the results show that the majority of the population of Djibouti is poor at the national level of which 89.46% lives in urban areas.The rural environment is the most affected by multidimensional poverty (95.31%). The values found in his research are close to ours for the urban environment, but for the rural environment the value of his study is higher than that found in our study, which is 89.9%.

The figures of our results are higher than those presented as results of the report on the evaluation of poverty in DR Congo by the World Bank, reported by the Federation of Enterprises of Congo (F.E.C,2019), on May 14, 2019 in Kinshasa, covering the period from 2005 to 2012, show that the poverty rate in DRC decreased by 5.3% (leaving 69.3% for 64%), because for them it was essentially urban poverty.

This difference in the proportion of poor people in urban and rural areas has been studied in depth by, he concludes that in urban areas there are many more job opportunities than in rural areas, and he finds that cities have a considerable weight of informal activities (trade, transport, chair rental etc.) which allow urban households to keep busy or work to find subsidies and be less affected by poverty.

Our results are very similar to those found by the Ministry of Planning during the participatory analysis of poverty carried out in 2005, where it found that, depending on the area of residence and the status of the head of household, the proportion of the poor population varied from 75% to 90% (Ministry of Planning, 2005).

Comparing our results with the report of the Ministry of Economy and Finance in February 2021 on the analysis of Multidimensional Poverty in Madagascar shows that the incidence of multidimensional poverty is 70.3% and the severity or extent is 54.9% in the country as a whole. The difference between this result and ours is due to the fact that our study was carried out in rural areas.

Comparing our results with those of Ninvielle in 2003 in Senegal's rural Oussouve region, we found a poverty incidence of 96%. This is numerically higher than our results.

As you have seen above, the Congolese sphere in particular, and Africa in general, still suffers severely from the socio-economic scourge of poverty.And our results invalidate the World Bank's hypotheses that Africa has seen an improvement in the incidence of poverty between the period 1990 to 2012, from 57% to 43% (World Bank, 2015).

We found that the severity or extent of poverty is 45.86% for our study environment, which consists of farmers in the Bamanga and Kole sectors, and it expresses the income distance between the poor themselves.

This result is slightly higher than that found by Ahmed Moummi in his analysis of poverty in the Democratic Republic of Congo using the FGT index, where severity is 17.5%.

Chaker in 2016 conducted a thesis study on the economic analysis of poverty in Tunisia: monetary and multidimensional approach.The results obtained in his study showed that the extent of multidimensional poverty is higher in rural areas than in urban areas, whatever the poverty thresholds chosen. In his study, he found (53.4%) in rural areas and (44.4%) in urban areas.The value found by Chaker for rural areas is very close to the value found in our study.

Hammadou's article in 2011 carried out a study of multidimensional poverty in Senegal. The results show that over 70% of Senegalese households are multidimensionally poor, and the average poor person suffers from over 39% deprivation. The difference between these results is that he assessed the whole country (urban and rural), but the plane only did in rural areas, as Chaker pointed out in 2016 when he said that the results obtained concerning poverty in rural areas are higher than in urban areas, whatever the poverty thresholds chosen.

With regard to the HDI, the results of our study show that the Human Development Index for the sectors of Bamanga and Kole, our study area, is 0.3.By being too much lower than 0.5, this index shows us that the level of development of our study is low.

The results of our study are correlative with those of Mokili (2019), who found that 100% of non-project beneficiary households had an HDI below 0.5 in his study on "The impact of agricultural projects co-financed by development aid partners on household poverty in Isangi Territory, DR Congo: Predictive factor and trajectory construction ", but for them this index was 0.42.

The HDI of our study area is far from the national HDI of the DRC (0.480 in 2019, as published by countryeconomy.com, 2022), but close to the national Human Development Index of 2014 (0.320). A Human Development Index value close to zero indicates poor human capital performance in terms of income, education and health status.

By comparing our results with those of Bousnina (2015) in his article on "Human development in Tunisia", he was able to obtain a Human Development Index of 0.3, which is equal to the value found in our study, revealing that the territories of Bamanga and Kole as a whole have a Human Development Index of 0.3.This equality is explained by the fact that both studies were carried out in regions where income, education and healthcare are very low.

V. Conclusion

The aim of this study was to identify the set of key variables that best explains the formation of multidimensional poverty status among farmers in the Banalia territory. Using the non-probabilistic reasoned-choice method, with the interview technique accompanied by direct field observations. The following results were found:

– In the two sectors as a whole, we note that 89.9% of households are identified as poor and deprived in an average of 45.86% of indicators.Poor people suffer 41.23% of the total deprivations that would be suffered if all households were deprived in every dimension that the territory of Banalia might experience,

– In both sectors, the Human Development Index is low (0.3),

– More than half of poor households are made up of elderly people, while at least 35% are young people.In addition, the households studied show diversity in terms of marital status.Over 60% of poor households are married, while 13.5% and 10.5% are widowed and single respectively,

– We note that the majority of poor households are larger than 10 people. Those with between 5 and 10 people are in second place, and those with at least 5 people are in last place,

– In terms of education, at least 34% of poor households have completed secondary school, 29.5% have a primary education and 20% are illiterate,

– With regard to ethnicity, it was found that more than half of the indigenous people (boa) are poor, while 18% of the Ngelema are poor and less than 15% of other ethnic groups are also poor in the study area.

– Multidimensional poverty is linked to secondary activities, ethnicity, household size and the level of education of household heads. However, this poverty is not a function of the age or marital status of household heads.

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