Research Article

The status and determinants of multidimensional rural poverty at household level: The case of Boricha Woreda, Sidama region, Ethiopia

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Abstract

Poverty is a complex and multifaceted social problem around the world, expressly in developing countries. Governments and national and international development agencies have sought to understand the multidimensional nature of poverty and the mechanisms to alleviate it. This study was conducted in Boricha Woreda, Sidama Regional State, Ethiopia, focusing to assess the status of multidimensional poverty of rural households and to find its determinants. A sample of 364 households was selected using systematic random sampling technique. The data were collected from primary and secondary sources. The multidimensional poor and non-poor households were identified using the Alkire-Foster method of multidimensional poverty, and the determinants of poverty were investigated using logistic regression models. Findings show that 40 percent of households are multidimensionally poor. The results of the binary logit model showed that education, cultivated land, agricultural income, livestock ownership, and frequency of contact with the population were statistically significant, which was theoretically expected to be associated with the multidimensional poverty status of rural households, showed a negative association at 1% and 5%. Promoting adult education, appropriate family planning, and quality healthcare are therefore important policy tools to adequately address multidimensional rural poverty.

Key words: Boricha Woreda, Multidimensional poverty, Multidimensional Rural Poverty, Sidama

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1. Introduction

For decades, income distribution statistics have been used to assess and analyze poverty (Sen, 1976). Hence both monetary and non-monetary factors are important in understanding and measuring poverty levels for individuals and households (Bourguignon & Chakravarty, 2003).

Poverty reduction has become a major development goal for governments around the world. For instance, Sustainable Development Goal 1 calls for eradicating all forms of poverty everywhere by 2030 (United Nations General Assembly, 2015, p. 15). This shows that poverty is increasingly recognized as a multifaceted concept that fundamentally requires a comprehensive approach to designing policies, strategies and programmes to combat it.

Poverty in Ethiopia is a major development problem that gave rise to many socioeconomic problems that threaten the survival and stability of the economy and society. As a result, poverty reduction has become the top development agenda of the country, and the government has designed and implemented numerous policies, strategies and programmes including Growth and Transformational Plan I and II, which cover the periods 2010/11 to 2014/15 and 2015/16 to 2019/20, respectively (Ministry of Finance and Economic Development [MoFED], 2010; MoFED, 2016). These efforts aimed at reducing poverty, improving the living standards of the people and promote national development. Despite such efforts, several studies indicated that poverty in Ethiopia remains high (Brown & Amdissa, 2007; Gelaw, 2010; United Nations Development Programme [UNDP, 2015]; Alkire & Kanagaratnam, 2018). The recent poverty assessment also shows that, with about 109 million people in 2018, almost 85 percents were multidimensional poor. Ethiopia is among the poorest countries in the world with a per capita income of US$790 (The World Bank, 2019). The Human Development Index of Ethiopia was 0.463 in 201, which put Ethiopia in the low human development class (UNDP, 2018).

The development of multidimensional theories of poverty provides a consensus that poverty is not one-dimensional. In 2007, Alkire and Foster (2007) developed a poverty measurement tool that allows for the measurement of multidimensional poverty using the concepts of the capabilities approach. This recent development has shifted the focus of poverty research from monetary approaches to multidimensional theories of poverty. The Oxford Poverty and Human Development Initiative in 2018, found that Ethiopia's Multidimensional Poverty Index (MPI), as measured by the Multidimensional Poverty Index, is 49%, while the incidence and intensity of multidimensional poverty are 84% and 59% respectively. This approach makes Ethiopia one of the poorest countries in the world.

Amartya Sen (2009) contended that lack of income cannot fully explain poverty and does not guarantee that someone will meet their minimum needs. Von Maltzahn and Durrheim (2008) emphasized that increase in income and consumption improve individuals' socio-economic well-being and capabilities, while Thorbecke (2005) argues that increases in income and consumption, such as access to electricity,

education, and health services, improve individuals' socio-economic well-being and capabilities Thus, while income or consumption expenditure are important, yet both are not a sufficient measure of poverty.

Various studies, for example, Hagos & Holden, (2003); Bogale, Hagedorn & Korf (2005); Alemu, Bewket, Zeleke, Assefa & Trutmann (2011); Bogale, (2011); Afera, (2015); Mekore & Yaekob, (2018); Biyena & Beyene, (2019) have been conducted to understand the problem of poverty in Ethiopia. Most of the studies used unidimensional approach for analysis and discussion that mainly focuses on the scope and determinants of poverty. But, only a few studies, such as Brück & Kebede (2013), Gerezgiher (2016), Bersisa & Heshmati (2016), Tigre (2018), Netsanet et al., (2021), have conceptualized poverty as multidimensional and used the Alkire-Foster method to assessed the determinants of dimensional poverty.

Currently, more poverty studies are based on multidimensional indicators, including education, health, and living standards. The studied three dimensions (education, health and living standards) and 10 indicators (adult education, school attendance, availability of health center, child mortality rate, electricity, housing, safe drinking water, cooking fuel, sanitation and assets) designed globally.

Despite various economic possibilities, multidimensional household poverty in Ethiopia remains high and unacceptable. Therefore, understanding the causes of poverty at the local level from a determinant perspective is important to address the complex issue of rural poverty and to inform policy makers. This is because effective, context-specific poverty reduction interventions require appropriate identification of factors with which poverty is closely related to this. In addition to the above global multidimensional poverty indicators, this study included or added new regionally important indicator, such indicator is distance to health centers that were not considered in previous studies. Therefore, the aim of this study is to document and assess the multidimensional poverty situation and its determinants among rural households in Boricha Woreda.

2. Review of Literature

There are three main schools of thought in literature concerning the definition and measurement of poverty. These theories include the welfare, the basic need and the capability views or schools of thought (Esubalew, 2006). Although these theories recognize poverty differently, there are areas in which they share some common meaning and all of them judge an individual or household to be poor whenever he/she is lacking a reasonable minimum standard.

Welfare School: Here, the concept of poverty is related to the economic well-being of the people. For the presence of poverty income is income the determining factor. Income based poverty assessment is the most widely used approach by global developmental organizations like the World Bank. It assumes that the person is poor when he/she is unable to attain a level of material well-being deemed to constitute a reasonable minimum by the standard of that society. Whenever income or consumption falls below a

predetermined monetaryequivalent poverty line, an individual or a household would be considered poor. According to Ravallion (1992), welfarists base comparisons of well-being solely on individual “utility" levels which are based on social preferences. Problems related to this school are the need to make inter-personal utility comparisons to obtain welfare functions, the degree of validity of full information and unbounded rationality on the part of consumers.

Basic Need School: Here, poverty is referred as deprivations that constrain the individual or family to meet the basic needs (World Bank, 2000). Poverty is seen as the deprivation of material requirements for the minimally acceptable fulfillment of basic human needs, including food (UNDP, 1997). This school considers that ‘something’ that is lacking in the lives of the poor is a small subset of goods and services specifically identified and deemed to meet the basic needs of all human beings. The needs in question are called ‘basic’ in the sense that their satisfaction is seen as a pre-requisite to quality of life; they are not initially perceived as generators of well-being. Instead of focusing on utility, the attention is on individual requirements relative to basic commodities. In the traditional basic need approach, the basic goods and services usually include food, water, sanitation, shelter, clothing, basic education, health services, and public transportation. As we can see, these needs go beyond the needs necessary for existence, known as minimal needs which only include adequate nutrition, shelter and clothing (Asselin and Dauphin, 2001).

Thus, according to basic need approach, poverty refers to lack of basic needs such as food, water, sanitation, shelter, clothing, basic education, health services and public transportation. It concentrates on the degree of fulfillment of basic human needs in terms of nutrition/food, health, shelter, education, transport and so on. Asselin and Dauphin, (2001) argued that one of the main problems which confront this school is the simple determination of what the basic needs are. It is generally nutritionists, physiologists and other specialists who are called on to determine the basic needs of individuals. However, they are not always in agreement with one another. Unfortunately, the precise measurement of minimum needs particularly nutritional needs and their largest component is extremely difficult, and the subject of intense debate.

Capability School: Amartya Sen (1992) defined poverty as the failure of basic capabilities to reach certain minimally acceptable levels. It is lack of wellbeing covering both monetary and non-monetary aspects. It is not the mere lack of income to meet basic needs but deprivations in basic human capabilities such as achievement in education, health, malnutrition and self-respect in society. It must be seen as the deprivation of basic capabilities rather than merely as lowness of incomes, which is the standard criterion of identification of poverty. Poverty can be sensibly identified in terms of capability deprivation; the approach concentrates on deprivations that are intrinsically important (unlike low income, which is only instrumentally significant).This school focuses on neither the economic well-being nor the basic needs deemed to satisfy the minimum standard by the society, but on human abilities or capabilities to achieve a

set of functioning. Such an approach to the definition and measurement of poverty suggests a broader set of criteria for assessing poverty than just income or consumption. This approach includes publicly provided but non-marketed services like: sanitation, health care, education and life expectancy (Phillip and Sanchez-Martinez, 2014).

Nowadays, all of these researchers and policy makers argue that poverty is not a one-dimensional or two-dimensional rather it is a multi-dimensional concept (Sen, 1999; Pantazis et al., 2006; Esubalew, 2006). Writers such as Jenkins and Miclewright (2007) and Anand (2008) pointed out that Sen's capability approach is considered to have novel and extensive significance for the conceptualization of wellbeing and multidimensional poverty. Therefore, in this research the meaning of poverty is related to capability perspective in which poverty is lack of adequate access to services (health, education) and living standard such as water, electricity, sanitation etc. Hence, in this study poverty was analyzed by capability approach.

Approaches of Multidimensional Poverty Measurement and Analysis

A number of methodologies have emerged to assess poverty from a multidimensional perspective. The following are different approaches of multidimensional poverty discussed by Alkire et al., (2015).

a) The Dashboard Approach

According to this approach, each dimension of poverty are measured separately as a unidimensional measure; together these measures give empirical understanding into the multidimensional nature of poverty and these may include deprivation indices that use a set of closely related indicators to reflect unidimensional concept other than monetary poverty, such as material deprivation. A prominent implementation of a dashboard approach has been the Millennium Development Goals: a dashboard of 49 indicators was initially defined to monitor the eighteen targets to achieve the eight goals. Dashboards have the advantage of broadening the set of considered dimensions, offering a rich amount of information, and potentially allowing the use of the best data source for each particular indicator and for assessing the impact of specific policies (such as nutritional or educational interventions). However, they have some significant disadvantages. First of all, dashboards do not reflect joint distribution of deprivations across the population and precisely because of that they are marginal methods. Among marginal methods, dashboards assess each and every dimension separately but a priori impose no hierarchy across these dimensions. Also, dashboards do not identify who is to be considered multi-dimensionally poor. Thus, the dashboard method does not indicate the direction and extent of changes in overall poverty.

b) The Composite Indices Approach

In this approach, the deprivation indices, possibly considered in a dashboard approach are converted into one single number. These indices have been published in the global Human Development Reports for several years. Well-known composite indices include the Human Development Index, the Gender

Empowerment Index and the Human Poverty Index. Composite indices, like dashboards, can capture deprivations of different population subgroups and can combine distinct data sources. In contrast to dashboards, they impose relative weights on indicators, which govern trade-offs across aggregate dimensional dimensions. Such normative judgments are very demanding and have been challenged (Ravallion, 2011b).

c) The Dominance Approach

The dominance approach enables us to state whether a country or region is or is not unambiguously less poor than another with respect to various parameters and functional forms but it becomes empirically difficult to implement beyond two or more dimensions. It also shares with the Venn diagrams the disadvantage of not offering a summary measure. Moreover, the dominance approach only ranks regions or poverty levels from different periods ordinally; it does not permit a cardinally meaningful assessment of the extent of the differences in poverty levels. Poverty dominance in the multidimensional framework is slightly different in that it needs to consider the identification method as well as the assumed relationship between achievements, namely, whether they are considered substitutes, complements, or independent. In a multidimensional dominance approach, a poverty frontier based on an overall achievement value of well-being for each individual is used for identification, and the overall achievement is required to be non-decreasing in each dimensional achievement.

d) Venn Diagrams

Venn diagrams are a diagrammatic representation that show all possible logical relations between finite collections of sets. The name of Venn diagrams refers to John Venn who formally introduced the tool (Venn 1880), although the tool pre-existed. Venn diagrams consist of a collection of closed figures, such as circles and ellipses that include, exclude, or intersect one another such that each compartment is associated with a class. The Venn diagrams graphically represent the joint distribution of individuals' deprivations in multiple dimensions. Venn diagram shows all possible logical relations between finite collections of sets. It considers the joint distribution of deprivations for 2-4 dimensions. Yet they become difficult to read when more than four dimensions are used and do not contain a definition of the poor per se.

e) Fuzzy Sets

In this approach, mathematical technique is employed to identify mathematically the poor using fewer normative judgments. The fuzzy set approach addresses the intrinsic vagueness of the being poor predicate by using membership functions at the identification step. It builds on the idea that there is ambiguity in the identification of who is deprived or poor. Thus, instead of using a unique set of deprivation cut-offs for identification, it uses band of deprivation cut-offs for each dimension. A person falling above the band is identified as unambiguously non-deprived, whereas a person falling below the band is identified as unambiguously deprived. Within the band of ambiguity, a membership function is chosen to assign the

degree to which the person is deprived. Fuzzy sets are used to construct a summary measure, and they may address joint. The challenge lies in selecting and justifying the membership function, as well as in communicating results.

f) Axiomatic Approach

This approach complies with the two steps of poverty measurement: identification and aggregation. In this approach, two broad identification methods have been used: the aggregate achievement approach and the censored achievement approach, with in the censored achievement approach, counting approach is used. The counting approach requires defining a deprivation cut-off Zi for each indicator Xi, so that each person is defined as deprived or not in each indicator by comparing her/his indicator achievement with the corresponding deprivation cut-off and then, applying some aggregation function to the achievements across dimensions for each person to obtain an overall or aggregate achievement value. A person is identified as poor when her/his aggregate achievement is below the aggregate poverty cut-off. The summary well-being measures of the poor are then aggregated to obtain a poverty measure of the poor people.

The methodology proposed by Alkire and Foster (2007, 2011a) (AF hereafter) which belongs to the axiomatic approach, is the one which has been empirically implemented to the largest scale through the Multidimensional Poverty Index. It is also the one which has been used in national multidimensional poverty measures developed by governments of Colombia and Bhutan, among others (Alkire & Santos, 2013).

3. Materials and Methods

3.1 Background of the study area

Boricha Woreda is found in one of the Sidama National Regional State in the country. It is located at about 305 Km from Addis Ababa and 32 Km is from Hawassa city. Boricha Woreda is a geographically, located at 6°49’21” to 6°28’12”N Latitude and 38°35’24” to 38°50’24”E Longitude. Relatively, Boricha Woreda the border of South by Darara, North by Hawassa Zuria, West by Bilate Zuria and East by Shabadino Woreda. Based on the (CSA, 2014) conducted by the Boricha Woreda has a total population is estimated to be 130,715 out of this 65,106 and 65,609 are males and females respectively. From this its 88% of populations are rural and 12% of populations are urban. The majority of the inhabitants are Protestants with 77.9% of the population reporting that belief 8.91% are Catholic, 8.22% are Muslims 1.81% observed traditional religions and 1.14% are Orthodox Christianity (Boricha Woreda Vital Events and Registration Office, 2023).

3.2 Research Design and approach

To achieve the stated objectives, both quantitative and qualitative methods are used to get accurate and complete information. Using both quantitative and qualitative data collection methods at the same time is

more advisable. Because quantitative data provides precise summaries and comparisons, while qualitative data provided general elaborations, explanations, meanings, and relatively new ideas. Taking all these into account, mixed approaches which combine both quantitative and qualitative methods were used for this study.

3.3 Sampling Technique and Sample Size determination

A multi-stage sampling technique was employed to select the representative sample for the study. In the first stage, Boricha woreda was selected purposive, because, this woreda has high population density, inadequate infrastructure (roads, networks, and electricity), poor provision for sanitation, and is located at the periphery of the other woredas'. In the second stage, the selected woreda (Boricha) contains 14 kebeles; from those 14 kebeles, 3 kebeles were selected by using a random sampling technique. The location of this selected kebele (Konsore Arke, Konsore chefa and Korangoge) is at the periphery of the woreda. Finally, from the selected kebele, households were selected by using a systematic random sampling technique. The numbers of households selected from each sample kebeles are determined using the proportional to-size sampling method to the respective total household size in each kebele to represent respondents of households by using (Yamane's, 1967) sample size determination formula.

Based on the data from the Boricha woreda administration bureau (2023), the total number of households in these selected kebeles was 4008. From this total population, the sample size of the study was determined by using the (Yamane, 1967) sample determination formula. Accordingly, the sample size is determined as follows: A 95 percent confidence level and e = 0.05 are assumed.

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{4008}{1 + 4008(0.05)^2} = \frac{4008}{11.02} = 364$$

Table 1. Total sampled household's proportion to the total population size from sampled kebeles.

No.	Sampled kebeles	Total population (N)	Sampled households (n)	Percentage share
1	Konsore Arke	1470	134	36.8%
2	Konsore chefa	1331	120	33%
3	Korangoge	1207	110	30.2%
Total		4008	364	100%

Source: Total Boricha woreda administration, 2023 and combination by researcher

3.4 Method of Data Analysis

In this study, global MPI developed by the Oxford Poverty and Human Development Initiative (OPHI) that encompasses ten indicators were modified according to the context-based consensus of group

discussants. Accordingly, three dimensions and 11 indicators were used to the measure multidimensional rural poverty in the study area. Hence, the index used in the study comprised 11 indicators and 3 dimensions. The weights and cutoffs for the collections of data were as recommended by Alkire and Foster (2011). The first work of data analysis was calculating multidimensional poverty analyses.

It was implemented using the following 11 steps:

Step 1: Choose a unit of analysis

Step 2: Choose dimensions.

Step 3: Choose indicators.

Step 4: Set poverty lines.

Step 5: Apply deprivation lines.

Step 6: Count the number of deprivations for each person.

Step 7: Set the second cutoff.

Step 8: Apply cutoff k to obtain the set of poor persons and censor all non-poor data.

Step 9: Calculate the headcount, H

Step 10: Calculate the average poverty gap, A.

Step 11: Calculate the adjusted headcount, M0.

Table 2. Dimensions, indicators and relative weights of deprivations of the MPI

Dimensions	**Indicators**	**Deprived if….,**	**Relative weight**
Education			1/3
	Years of schooling	No household member aged 10 or older has completed five years of schooling.	1/6
	Child school attendance	Any school-aged child is not attending school up to the age at which they would complete class 8.	1/6
Health			1/3
	Child mortality	Any child has died in the household within the last five years.	1/9
	Availability of health center	If no public health center is found in the area	1/9
	Distance to health center	It would take 5km or move to reach the nearest health public health center	1/9

Living Standard			1/3
	Electricity	The household has no electricity.	1/18
	Improved sanitation	The household's sanitation facility is not improved (according to the Millennium Development Goals (MDGs)), or it is improved but shared with other households.	1/18
	Safe drinking water	The household does not have access to safe drinking water (according to MDG guidelines) or safe drinking water is a 30-minute walk or more from home, round-trip.	1/18
	Flooring	The household has a dirt, sand or dung floor.	1/18
	Cooking fuel	The household cooks with dung, wood or charcoal.	1/18
	Assets	The household does not own more than one radio, TV, telephone, bike, motorbike or livestock, arable land and does not own a car or truck	1/18

Source: Adopted from OPHI, 2017 and modified by the researcher.

The MPI was calculated by multiplying the incidence of poverty with the average intensity of poverty across the poor (MPI = H x A); as a result, it reflects both the share of people in poverty and the degree to which they were deprived. Households were identified as multidimensionally poor (or "MPI poor") if they were deprived in at least one-third of the weight of indicators shown above; in other words, the cutoff for poverty (k) is 33.33% (Alkire et al., 2016). The detail of dimensions and indicators used for the analysis of multidimensional rural poverty in the study area is explained in Table 2.

3.5. Hypothesis

H1: Multidimensional poverty indicators has significant effect on rural households.

H2: Health dimensions, educational dimensions and living standard dimensions have significant effect on the rural households.

H3: The relationship between socio economic and demographic characteristics of the multidimensional poor households in the study area.

Econometric model

Logistic regression was used to analyze relationships between a dichotomous dependent variable and independent variables of any form. Logistic regression combines the independent variables to estimate the probability that a particular event will occur, in this case the probability of the household falling above the cut-off point (k=33.33%) or not.

Many studies have ensured that when the dependent variable of interest is of qualitative nature and dummy, binary logit model is the best (Gujarati 2003; Green 2003). Similarly, since poverty analysis qualifies to the above notion, binary logit model was used for this study. Following Gujarati, 2003), the functional form of logit model is specified as;

$$\mathrm{Pi} = \mathrm{E}\left(\mathrm{Y} = \frac{1}{\mathrm{x}_{\mathrm{i}}}\right) = \frac{1}{1+\mathrm{e}^{-(\beta_0+\beta_1 \mathrm{x}_1)}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(1)}$$

Here P_i, is the probability that a given household is being poor. For simplicity, we can write (1) as,

$$\mathrm{P_i} = \frac{1}{1+\mathrm{e}^{-\mathrm{z_i}}}, \text{where } \mathrm{z} = \beta_0 + \beta_1\mathrm{x}_1 + \beta_2\mathrm{x}_2 + \beta_3\mathrm{x}_3 \ldots\ldots\ldots\ldots \beta_\mathrm{n}\mathrm{x}_\mathrm{n} \ldots\ldots (2)$$

The probability that a given household non poor is

$$1 - \mathrm{P_i} = \frac{1}{1+\mathrm{e}^{\mathrm{z_i}}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Therefore, the odds ratio in favor of the poor is

$$\frac{\mathrm{P_i}}{1-\mathrm{P_i}} = \mathrm{e}^{\mathrm{z_i}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Taking the natural logarithm of (3) we obtain,

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots\ldots\ldots\ldots + \beta_{11}x_{11} + U_i \ldots\ldots\ldots\ldots (5)$$

Thus, the model is specified as follow for this study;

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = Z_i = \beta_0 + \sum_{i=1}^{n} \text{ßiXi} + U_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

Where, L_i is the log of odds ratio, Z_i is the function of n explanatory variables, P_i is the probability of being multidimensional poor, 1-P_i is the probability of being multidimensional non-poor, β_0 is the intercept of the equation, $\beta_1, \beta_2 \ldots\ldots \beta_{11}$ are the slopes of the equation in the model and X_i*'s* are the explanatory variables included in the model.

Dependent variable

Multidimensional Poverty status (MPS):

The dependent variable of this study is the multidimensional poverty status. Following Alkire and Santos (2011) method of measuring multidimensional poverty, a household's deprivation score (*ci*) is compared

with the multidimensional poverty cut-offs (*k*). A house is considered poor if they are deprived in at least one third of the weighted indicators. In other word a household is identified as poor if it has a deprivation score greater than or equal to one-third (33.33 percent) (Alkire and Santos, 2011; OPHI, 2013). Following this we used 0.3333 as a cut off point for this study. This is represented by the binary variable (Yi) that takes the value 1 or 0, as:

$$Yi = \begin{cases} 1, \text{ if a household multidimensional poor } (c_i \geq 33.33\%) \\ 0, \text{ otherwise} \end{cases}$$

Table 3. Definition and measurements of all variables with expected signs

Variable	Code	Type	Description	Expected sign
Multidimensional Poverty Status	MPS	Dummy	1=if household is multidimensional poor 0 = otherwise	Dependent
Age	Age_HH	Continuous	Household age in number	+/-
Sex of household head	Sex_HH	Dummy	1= if HH is male 0= otherwise	+
Education level of household head	Edu_HH:	Continuous	Education level of the head in years of schooling	-
Family Size	Fam_size	Continuous	Number of person in the household	+
Farm Income	Farm_inc	Continuous	Households with farm income	-
Off-farm Income	Off_inc	Continuous	Amounts of income earned in birr	-
Land Size	Land_size	Continuous	The size land in hectares	-
Distance to Market	Dist_mkt	Continuous	Hours. of time taken to get the nearest market	+
Livestock Ownership	TLU	Continuous	Number of livestock owner	-
Access to credit	CRDT	Continuous	Access of get credit from different institutions	+
Frequency of Extension Contact	Freq_ext	Continuous	Household head visited extension agents per month.	-

Source: Household survey data, 2023

4. Results and Discussion

4.1. Description of Households Multidimensional Poverty Status

The main motivation for measuring for deprivations in multidimensional indicators is that people who are identified as poor in this measure may not coincide with those who are income poor. Thus, using the MPI indicators deprivations scores for Boricha woreda was done based on the three dimensions of multidimensional analyses.

As can be seen in Table 4, findings revealed that a higher proportion of households (79.67%) were classified as multidimensional poor, while 20.33% of households were found to be multidimensional non-poor. This shows that the greater proportion of surveyed households are suffering from acute multidimensional poverty as they are deprived of basic and multiple human services and facilities. Households suffer multiple deprivations in education, health and living standard dimensions of wellbeing. Such severe deprivation in these dimensions led to functioning failure and low quality of life, which in turn leads to higher incidence and intensity of multidimensional deprivation of poor households. Although prior studies on multidimensional poverty in the study district are not found, this finding is largely higher than the official monetary poverty report of Ethiopia, which is 36.7% in 2019 (Planning and Development Commission, 2021).

Table 4. Percentage Distribution of Households by Multidimensional Poverty Status (at k=4)

Households Poverty Status	Frequency	Percent
Multidimensional poor	290	79.67
Multidimensional non-poor	74	20.33
Total	364	100

Source: Household survey data, 2023

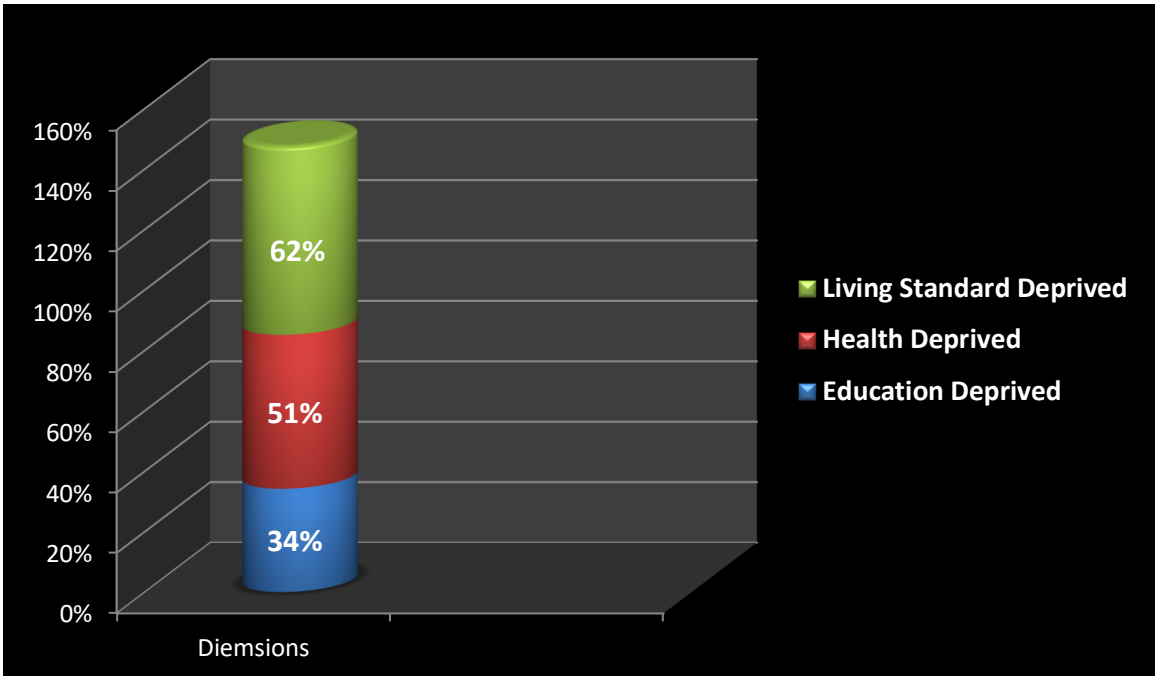
4.2. Multidimensional deprivations in Boricha woreda

The survey result below Figure1 revealed the percentage of people who are deprived in different dimensions of the multidimensional analysis within Boricha woreda. The percentage of household deprived in living standard, health and education were gives to be 62.38 percent, 51 percent, and 34.20 percent respectively. Accordingly, deprivations in Living standard deprivation tend to be highest in the woreda as compared to that of Health and Education deprivations.

The result further shows that more households are deprived in important functioning are of life in rural areas of Boricha woreda. Rural households still have rural households own fewer assets, and have less access to communication, safe drinking water and rural electrification. More households still live farther than 5 kilometers from a health facility, and the death of a child less than 5 years is still more prevalent in rural areas of the woreda. Furthermore, rural illiteracy rate and children out of schools are fewer when

compared with other indicators.

Figure 1. Key Multidimensional deprivations in Boricha woreda

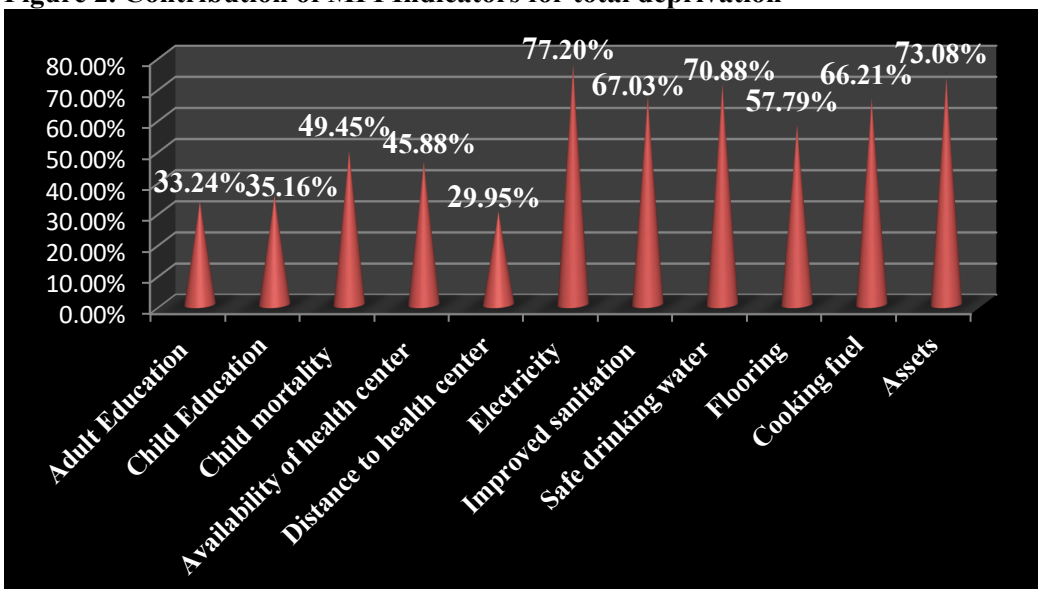


Source: Household survey data, 2023

4.3. Contribution of MPI Indicators for total deprivation

The below Figure 2 revealed the contribution of indicators for total deprivations in the Boricha woreda. The survey result shows that education dimensions revealed indicators of adult education and child enrollment deprivations are 33.24 percent and 35.16 percent respectively. The study also show deprivation in Health indicators of distance of health center, availability of health center and child mortality were found to be 29.95 percent, 45.88 percent and 49.45 percent respectively. In the last deprivation of living standard indicators, deprivation in floor, cooking fuel, improved sanitation, safe drinking water, assets and electricity were found to be 57.79 percent, 66.21 percent, 67.03 percent, 70.88 percent, 73.08 percent and 77.20 percent respectively.

Figure 2. Contribution of MPI Indicators for total deprivation

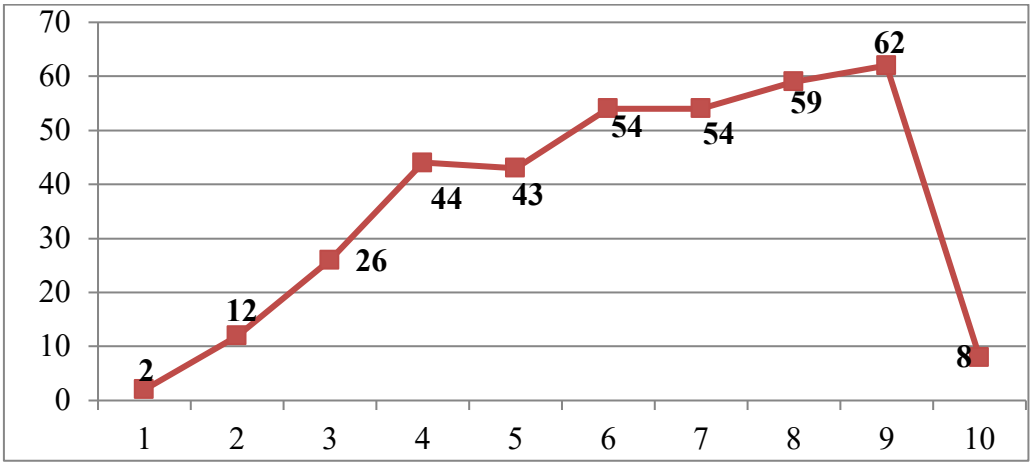


Source: Household survey data, 2023

4.4. Multiple Deprivations of Indicators of the Households

Figure 3 revealed that from the total sampled households, 62 households deprived in nine indicators simultaneously. On the other hand, only 8 individuals faced simultaneous deprivation in ten indicators. Furthermore, the above graph also showed that all the 364 households are deprived at least in one indicator. In general, multiplicative deprivation is unevenly distributed among the households and its inclusion in the estimation would have an advantage to understand the severity of poverty that arose due to multiple deprivations. This severity due to multiplicative deprivations is different from the severity of an indicator that captured by the deprivation gap. As shown in Figure 3, those 8 households who are deprived in 10 indicators simultaneously are suffering more than any other households in the sample.

Figure 3. Simultaneous deprived indicators



Source: Household survey data, 2023

As can be seen in the Table 5, the multidimensional poverty headcount, H, is 0.8 indicating that around 80% of households were deprived in at least three of the indicator dimensions. The average intensity of deprivation, which measures the share of deprivation of each poor person experiences on average, is 50 percent. Once this is adjusted for the number of deprivations suffered, the MPI is computed as 0.4. This indicates that 40% of the sampled households are multidimensionally poor.

Table 5. Over all Multidimensional Poverty Estimation

H(Incidence)	A(Intensity)	MPI
0.80	0.5	0.40

Source: Household survey data, 2023

4.5. Determinants of multidimensional rural poverty

Before presenting binary logistic regression outputs and drawing conclusions based on variables that determine the possibility of multidimensionally poor, it is important to confirm that the data fit the basic expectations of the model, if not outcomes may be confusing. As to Bewick et al. (2005), the weak correlation among the explanatory variables is a prerequisite before running the model. Therefore, diverse multicollinearity diagnostics tests were executed to crisscross the level of collinearity between each independent variable.

Among the diagnostic tests conducted, Spearman's correlation matrix and variance inflation factors were used to check the presence of multicollinearity among the explanatory variables. There were no

independent variables that had Spearman's correlations near ±1 and the p-values revealed significance very low (0.01) level. Likewise, the VIF for the independent variables used in this research extended between 1.321 and 1.767. As to Gujarati (2004), there is no linear relationship among the tested independent variables since the VIF was not exceeded 5 for all tested variables. This qualified the explanatory variables to be included in the model. The contingent coefficient result indicated as there is no correlation between the given two independent variables exceeded to that amount implies dependencies. Therefore, it has been concluded as the level of associations between independent variables is not a serious problem in this logistic regression analysis.

4.6. Binary logistic regression result

Marginal effect for Binary Logit Regression since the logit model were employed for regression is not linear, the marginal effect of each explanatory variable on the dependent variable is not constant but it depends on the value of the explanatory variables. Thus, marginal effects can be a means for summarizing how change in a response is related to change in a covariate. For categorical variables, the effects of discrete changes are computed, i.e., the marginal effects for categorical variables show how P(Y=1) is predicted to change as X_k changes from 0 and 1 holding all other X_{nk} equal. Whereas for continuous explanatory variables, the marginal effect measures the instantaneous rate of change (Greene, 1993).

Table 6. Logistic regression result through analysing multidimensional rural poverty

	Coef.	dy/dx	Z	P>z
Age_HH	0.0640	0.020	1.900	0.057*
Sex_HH	1.3160	0.042	1.620	0.105
Edu_HH	-0.2170	-0.701	-1.820	0.068*
Fam_size	0.3090	0.101	1.770	0.077*
Farm_inc	-0.0060	-0.100	-6.500	0.000***
Off_inc	-0.0001	-0.001	-0.110	0.916
Land_size	-1.5630	-0.145	-8.010	0.000***
Dist_mkt	0.0400	0.001	0.080	0.918
TLU	-1.2740	-0.041	-2.620	0.009**
Freq_ext	-1.0080	-0.032	-2.210	0.027**
CRDT	0.0001	0.001	0.140	0.886
Constant	8.2560			

*Note: * **, **, *, significant at 1%, 5% and 10% degree of precision respectively*

Age of the Household Head: Based on regression result output, the age of the household head is significant and has positively related to multidimensional rural poverty status. That implies the probability of being multidimensional poor increases when household age increases. Specifically looking from the marginal effect, keeping other factors constant, one year increase in age, the probability of being multidimensional poor increased by 0.02 on average.

Different scholars argue that poverty increases at old age (Sabir et al., 2006) and (Hilina, 2005). This is because the productivity of the individual decreases and the individual has few savings to compensate for the decrease in productivity and income. This is of course, more likely to be the case in developing countries where savings are low because of low income and old age being mostly dependent. The others contend that age is correlated with higher productivity and hence impacts welfare positively. A third view that could be worthy of note to see is that neither of the two approaches is correct. This is because the relationship between age and poverty might not be linear, as we would expect that incomes would be low at a relatively young age, increase at middle age, and then decrease again. These findings confirmed the conclusions of other studies, such as those (Tamiru, 2020; Netsanet, 2021).

Education Level of the Household Head (Edu_HH): As indicated in the binary logit estimate Table 6 above, the association between education and being multidimensional poor for a household is significant at 10% significance level. As the head of the household education level increases by one grade the probability of a household being multidimensional poor decreases by 0.0701 holding other variables constant. Many empirical evidences report that educated persons have opportunities to get employment with good income and perform business activities based on the knowledge they acquired. Descriptive analysis also indicated that falling into poverty is lower for households with higher education level. This implies that the association between multidimensional poverty and level of education is higher. According to the information captured from FGD participants *"an increase in the education level of rural households, there is a likelihood of decreasing in a poor state. In other words, if someone is not educated: he/she is poor, violet spouse and children rights and less represented in woreda or kebele level parliament"*. The finding of this study is compatible with the studies (Elias, 2020 and Netsanet, 2021).

Households Family Size (Fam_size): Household family size appeared to be significant in determining household's multidimensional poverty status in the study areas. It was positively related and the coefficient is statistically different from zero at 10% significance level. The positive relationship indicates that the probability of being multidimensional non-poor decreases or the probability of being multidimensional poor increases with an increase in the family size. This is in agreement with findings of Zegeye (2017) and Elias

(2020) that indicated a household with a larger family size tends to be multidimensional poor. The marginal effect of 0.1 for family size implies that, other things being constant, the marginal effect in favour of being multidimensional poor increases by a factor of 10% as family size increases by one adult equivalent. Triangulation of these results with qualitative data collected from interviewee shows that: "Having many children tends to poverty! In the past, having many children was considered a blessing in our time, but we were wrong". Hence, this is in agreement with the hypothesis that the family size is likely to play a role in determining the status of poverty at household level. This clearly shows the importance of controlling population growth in the study area.

Frequency of Contact Extension Service (Freq_ext): The frequency of extension contacts made by rural households per month was negatively and significantly related with multidimensional rural poverty at 5% probability level. This is due to the fact that household heads who are in close contact with development agents could receive extension advices, trainings and demonstrations on livelihood strategies and associated issues relevant to them, and even the adoption of new agricultural technologies are promoted via extension advices or contacts received by households. The average marginal effect (-0.032) shows that for each additional extension contact days made per month, the probability of a household to exit multidimensional poverty increases by about 3.2% on average, holding other variables constant. Participants of the FGD reflected that *"rural households who get accessed to agricultural extension services/training are expected to be less chance of being poor than those who did not"*. The result of the study is consistent with the findings of Elias (2020), in that rendering extension services to rural households is found to be negatively and significantly influence the likelihood of a rural household to be multidimensional poor at 10% probability level stressing that poverty reduction motives could succeed through extension advice and technology promotion.

Cultivated Land Size: Size of farmland, which is significant at less than 1% probability level, has negative influence on the probability of household's being multidimensional poor in the study area. It implies that the probability of being multidimensional poor decreases with large cultivated land size. This agrees with the hypothesis that farmers who have larger farm land holding would be less multidimensional poor than those with smaller land size, due to the fact that, larger farmers are associated with higher possibility to produce more food. Household with large size of land can have wealth and income which increases availability of capital that could increase the probability of investment in purchase of farm inputs which increases food production and hence ensuring food security of farm households. The marginal effect of 0.145 for the total cultivated farm size implies that other things kept constant, the probability of being multidimensional poor decreases by 14.5% as the total cultivated farm size increases by one hectare. The

result of the study is consistent with the findings of Zegeye (2017) and Elias (2020) that indicated with large cultivated land size leads to decrease multidimensional poverty.

Livestock Ownership in TLU: Livestock is an economic factor that is negatively associated with and protective factors of multidimensional rural poverty. Owning livestock was significantly associated with multidimensional rural poverty at a 5% probability level. According to the model result, it has a marginal effect of -0.041 which means for every additional increase of livestock in TLU, the likelihood of multidimensional poor decreases by 4.1% on average, holding all other variables constant. This finding is matched with the findings of Zegeye (2017), Elias (2020), and Melkamu et al., (2022), where livestock was found significant to reduce multidimensional poverty at a 1 percent of statistical significance. The conceivable description for this is that livestock has a very decisive role in the life of rural people being a food source, means of transportation, draft power, income-generating source, production force, and status determinant in rural areas social context. In the FGD, one person briefs as "*livestock is a bank for the rural community where they save money during the good season and drawback money during drought as well as any health and social problem encounter there"*. Therefore, it is possible to conclude by saying that the more the livestock the lower multidimensional poverty levels and even more likely to become better off over some time.

Farm income (Farm_inc): Since farm income is the basic source of income for the rural poor, it has a tremendous impact on the probability of households to experience multidimensional poverty. Thus the variable has significant and negative relation with status of multidimensional poverty at 1% level of precision. The regression result revealed as household farm income increases by one Birr, the probability of households falling into multidimensional poverty decreases by 10 percent keeping all other factors constant.

The study finding conforms to Melaku (2021) who underscored rural households earning more farm income from agricultural production helps them to relieve financial scarcity and to use it for satisfying the household needs and leads them avoid experiencing poverty.

5. Conclusions and Recommendations

Conclusions

High multidimensional rural poverty is manifested by poor sanitation, shortage of infrastructure, inadequate education system, and poor living standard are common features of Ethiopian rural poverty. The above-mentioned problems are common features of the Ethiopian rural area. So, this study tried to evaluate the determinants of rural households' poverty in the study area. Based on the key finding of the study, the

following conclusion has been drawn by the researchers.

The study used AF methods approaches to identify the poor from the non-poor. People are counted as multidimensionally poor if they are deprived in one–third or more of 11 indicators, where each indicator is equally weighted within its dimensions, so the education indicators are weighted 1/6, health indicators are weighted 1/9 and living standards are weighted 1/18 calculating by using their indicators (Alkire et al., 2020). If the multidimensional poverty level of the household is above the cut-off, the household considers multidimensional poor whereas if it is below the poverty cut-off, the household is considered as multidimensional non-poor at cut points (k) =33.33%

Household family size was related to multidimensional poverty positively and significantly. A household with larger family size are found to be multidimensional poor than a household with lower family size. The larger family size requires more resources to adequately meet the needs of the household members. But poor households with larger family members failed to meet these needs to their family members.

Level of education of a household head and multidimensional poverty are negatively and significantly related in this study. The household with its head acquired higher education level exhibited lower probability of falling into multidimensional poverty and vice versa. It is obvious that a household with educated labor have higher opportunity of getting employment with better income. It also undertakes businesses that are profitable enough. Hence, households head with higher educational level enjoyed relatively higher income in the study area this study also much related with qualitative evidence.

Cultivated land holding is also negatively and significantly related with multidimensional poverty indicating larger land holding reduces rural multidimensional poverty through securing food need and earning substantial on-farm income for securing non-food basic needs. However, expanding any more land holding today is increasingly rare because of increasing demographic pressure or population size on land and degradation of the existing land resource. Farm income is the basic source of income for the rural multidimensional poor; it has a tremendous impact on the probability of households to experience multidimensional poverty. Thus, the variable has significant and negative relation with status of multidimensional poverty. And the result also related with qualitative evidences. Besides, frequency of extension contact is negatively and significantly related with multidimensional poverty implying that households who contacted extension workers more are nearer for transfer of new technologies pertinent to better improve their livelihood strategies.

Recommendations

In order to improve the households' living status in the study Woreda; the following might be the major areas of interventions and policy options.

First, the more literate is the head of household, the more the chance of being freed from poverty for they are able to understand how to make living and lead decent life. The positive contribution of human

capital for positive return to labour calls for an integrated intervention of rural people-centered education tailored to promote education in all issues linked with rural livelihood and health via formal institutions like adult education coupled with expansion of health institutions on behalf of establishing literate, healthy and hence ultimately poverty free rural households.

Second, the family size is likely to play a role in determining the state of multidimensional rural poverty at household level. The study results are supportive for drawing conclusions toward the importance of decreasing fertility, and this clearly showed the importance of controlling population growth.

Third, increased physical asset holding in terms of farmland and livestock holding was highly correlated with improved multidimensional poverty status of the households. In addition to increasing the farm size, improving the farm land under cultivation to enhance its quality by promoting watershed management, conservation practices and timely delivery and properly using agricultural inputs could also help improving the productivity of land and strengthen the inter-resettlement programs was appropriate in order to enhance food security through the settling a side of adequate areas of agricultural lands and other natural resources for the production of food and other source of income in the short run.

Fourth, promoting farm income activities can be materialized through provision of rural financial services that can help farmers in solving capital problem to buy farm oxen, farm inputs, use for trade, etc.

Fifth, the frequency of extension contact is negatively related to multidimensional rural household poverty implying that households who contacted extension workers more are closer for transfer of new technologies relevant to better improve their livelihood strategies. Extension workers play a key role as a means of technology transfer from technology site to farmers' site. Investment in extension program is another area of intervention through capacity building to promote the existing research-extension-farmer linkage to a higher stage.

Finally, the study tried to incorporate important multidimensional deprivation as manifestation of rural poverty in the study area. Therefore, taking this as a yardstick for further analysis of poverty in the area using multidimensional analysis has its own importance to alleviate poverty by identifying its root causes since poverty is multidimensional by itself. Further it is better to conduct detail investigation on the problem by incorporating inequality since poverty incidence is very high in the study area.

Considerations for further research

Different countries and researchers add different dimensions like income, empowerment, and so on. Hence, the researcher agrees with the addition of additional dimensions and urges different researchers to add other relevant contextual dimensions under the methodological framework of Alkire and Foster.

This study practiced household as the level of analysis. However, poverty can be analyzed at the individual level or intra-household level. In other directions, child or women-based multidimensional poverty analysis can be studied at the micro or macro level of analysis. Therefore, future researches can focus on one of these study areas.

The construction of comprehensive poverty profiles at the Boricha woreda administration level is vital but the task could only be possible if there is a commitment from the government, woreda administrators, NGOs, researchers, the residents, and any concerned body. This research is cross-sectional which only can tell the result of a one-time survey. The availability of panel data is, therefore, seriously needed to be able to construct better models of the determinant's of multidimensional rural poverty in the woreda.

The study assessed the incidence of multidimensional poverty in the selected kebeles at a household level. It can tell the incidence of multidimensional poverty based on these households. It is the writer's feeling that future studies should study multidimensional rural poverty other than at the household level so as to get a wider view of poverty profiles and policy implication. The study employed the MPI approach in the identification of the multidimensional poor from non-poor. The validity of this research could be testified if other approaches are applied. Therefore, methods other than the ones developed should be incorporated into other studies in the future.

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