

Measurement of Income Inequality and Its Determinants in District Dir Lower

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Abstract

The objective of the present study was to measure income inequality and to analyze determinants of income inequality of the households in the study area conducted in three villages Madinaabad, Shamshikhan, and Ziarat were randomly selected from the Lower Dir district. Data were randomly collected from 82 sample households with the help of an interview schedule. Gini-coefficient, Palma ratio was used to measure income inequality in the selected area while Lorenz curve was used to represent income and inequality. A logistic regression model was used for analyzing the determinants of income inequality of the households in the research area. Results of the study revealed that the value of Gini-coefficient for villages Madinaabad, Shamshikhan, Ziarat and for the overall area were 0.22, 0.30, 0.34, and 0.31 while Palma ratio for villages Madinaabad, Shamshikhan, Ziarat, and for the overall area were 0.63, 0.88, 1.14 and 1.06, respectively. Results of binary logistic regression showed that the odds ratio of age, education and the number of dependents was 1.084, 0.862, and 0.306, respectively, which showed that income inequality increases with the increase of one year of age by 8.4 percent. In contrast, education and earners decrease income inequality in the research area. Based on research findings, providing quality education and proper use of land resources can reduce income inequality in the study area.

Keywords

Binary Logistic Regression, Income Inequality, Gini-Coefficient, Palma Ratio, Lorenz Curve, Household, Dir District

1. Introduction

Income inequality works together with financial growth in positive or off-

putting ways (Qin et al., 2009). Income disparity helps to wreck social equality that encourages interest also stimulates financial growth. However, the continuous rise of income inequality reduces consumption levels which delay the development of the monetary sector (Coes, 2008). In countries like Pakistan, there is always a large gap between rich and poor. The prosperous households are those whose requirements for spending have almost been met, having most of the assets with them, while the poor households have low income and vigorous requirements for consumption purposes. The consumer market under these circumstances does not grow easily due to the extremely infertile situation of the market. A prominent assumption about income disparity with the economic development is that “income disparity in the start increases and then decreases with economic development” (Li et al., 2015).

There is a large gap of income inequality exists between the rural and urban population in the developing countries, mainly because of the dependency of rural society on low-paid agricultural activities while the people of the urban areas are mostly engaged in highly paid jobs and with business activities. Income inequality leads to several problems like uneasiness, violence, and corruption. A macroeconomic objective of the governments is to equate income supply between rural and urban households. The equal share of income flanked rural and urban people can be predicted as it relates to poverty. Analysis of the results of income inequality revealed some threats in the occurrence of scarceness. The objective was to decline income inequality obtained with the analytical and arithmetic studies (Morduch & Sicular, 2002).

The big hurdle of policy makers to build up the linkage between socio-economic characteristics and income inequality is to analyze income structurally and dynamically among various socio-economic groups of the economy. The participation of each income source in the entire discrimination has been estimated. Obtained results revealed that the labor force contribution highly affects the variation of income among different households (Fournier, 1999).

In the rural areas, the non-farm sector provides an important protection network by providing as long as employment though insufficient earnings that helps to put off helpless and poor people of society from falling more into poverty. There is a strong relationship linked by non-farm employment with comparatively high educational levels, and so on. It is observed that the non-farm contribution is higher in areas located or connected with an important network of roads for a quicker approach to urban area centers. That's why poor people in rural areas are mostly landless and small land holders who cannot acquire wealth and approach to information along with networks. People that belong to communally broken groups and those living in inaccessible areas cannot contribute more than others in the non-farm sector, mainly in behaviors that would be talented at picking them up out of fewer amounts (Iwasaki, 2015).

Income Inequality in Pakistan

In rural areas of Pakistan main contribution to the income of the people is done

by farm and non-farm sources. The major source of income for these people is agriculture. In Pakistan, Agricultural productivity is low because of unequal distribution of landholding, using traditional techniques for agriculture, and high unemployment rate in rural areas. The land is an important factor in the agriculture sector: however, land distribution in Pakistan is unfair. Approximately 67% of households are landless, and 0.1% possesses one or more than one-hectare land holdings. The optimistic relationship existed flanked by landholdings and household income (Chaudhry, 2003).

Traditional techniques of agriculture still exist in the agriculture sector of Pakistan. Due to the low purchasing power of small farmers and lack of knowledge about modern agricultural tools, high yielding procedures of production are not applicable. Farmer's income can be increased by raising productivity, and this can be done by provision of knowledge and modern equipment to them. As the income of farmers rises, their production will be increased, and with this, other people's income is indirectly affected by diminishing prices of agricultural products (Chang & Chang, 2011).

Livestock is a major component of agriculture. There is a good relationship between farm extent and livestock income (Meena et al., 2017), and it mainly contributes to the agriculture output of rural areas. About 11.6% contribution to GDP is made by it. Approximately 35 million rural people used to practice livestock activities in Pakistan. Approximately 30% - 40% of the population is obtained their income from the livestock sector. It is confirmed from reviewing previous studies that there is a strong affiliation flanked by livestock with the income and spending of the households (Jan et al., 2008). It provides income in various forms such as flesh, milk, and cow dung which is rich in minerals; therefore, it is a multidimensional source of income. About 16% of the total household fuel in the form of dung is provided by livestock.

Over time, landlessness in rural Pakistan increases, due to which a large number of rural laborers tend from agriculture to less productive activities in the non-farm sector. Yet, a low return from such activities may cause an increase in household income which gives rise to the household's welfare. The non-farm sector in the rural area can be divided into sub-sectors like communication, transportation, services, industries, and businesses. Income that is obtained from sources other than agriculture is called non-farm income from the accommodation of rising population agricultural land converting to buildings and houses due to which agricultural activities are shrinking day by day. Non-farm activities increase because the Agriculture sector is not able to accommodate the increasing population. Non-farm income does not depend upon land distribution. This sector provides job opportunities to the rural labor force (Malek & Usami, 2009).

In order to take suitable initiatives and to properly allocate resources, income inequality must be measured properly. There are two major sources of income in rural Pakistan, farm, and non-farm, which contribute to the major part of rural income. The agriculture sector accumulates 60% of the labor force in rural areas (GOP, 2012). Unequal distribution of landholdings creates unemploy-

ment, conventional methods of production methods are considered the main features of agriculture in Pakistan, resulting in low productivity. There is a direct relationship between landholdings and household income (Chaudhry, 2003).

As a developing country, Pakistan also faces high income inequality. In Pakistan, the value of the Gini coefficient was 33.50, estimated by the World Bank for the year 2019. Although the economic indicator shows, an improvement but still cannot decrease the gap between incomes of different social classes. As compared to uneducated person educated persons have a great inclination of selecting a non-farm occupation. As compared to urban areas of Pakistan, rural areas have a low literacy rate. According to recent research, Pakistan's total literacy rate is 57% approximately. Its rate is 74% in urban areas, and in rural areas, it is 49%. The literacy rate for males in rural areas is 63%, and for females, it is 35% respectively, household's income with education flanks a great relationship. Higher education leads to an increase in the income of households (Chaudhry, 2003).

As a developing country, Pakistan also faces high income inequality. In Pakistan, the value of the Gini-coefficient was 33.50, estimated by the World Bank for the year 2019. Although the economic indicator shows, an improvement but still cannot decrease the gap between incomes of different social classes. As compared to uneducated person educated persons have a great inclination of selecting a non-farm occupation. As compared to urban areas of Pakistan, rural areas have a low literacy rate. According to recent research, Pakistan's total literacy rate is 57% approximately. Its rate is 74% in urban areas, and in rural areas, it is 49%. The literacy rate for males in rural areas is 63%, and for females, it is 35% respectively, household's income with education flanks a great relationship. Higher education leads to an increase in the income of households (Chaudhry, 2003). The rest of the paper is structured as follows. Section 2 comprise of the literature reviewer. Section 3 copes with the research universe, sample size determination, sampling technique, collection and analysis of data, including preparatory measures, distribution and pre-testing of the interview schedule, and analytical framework of research. The corresponding results, discussion and findings are discussed in Section 4. Section 5 consists of the conclusions and recommendations.

2. Review of Literature

This part contains a review of research studies that are related to income inequality in different areas. It helps to know about the methods of research as well as to determine a well-organized and systematic structure for the research. The main aim of this chapter is to point out the difference in methods used and their impact on the results. A brief appraisal of the related text is given in the section below.

Aaberge et al. (1996) conducted a survey on income inequality and mobility in the United States of America and Scandinavian countries during the 1980's; he

used Gini-coefficient to measure income inequality. The results revealed that income inequality is lesser in Scandinavian countries as compared to the United States. The results showed that with extending the income accounting period to 11 years, income inequality in the country remains unchanged, while the mobility pattern was found similar despite huge differences between social policies of the United States and Scandinavian countries. [De Sousa \(2000\)](#) analyzed the aspect of occurrence of income inequality and scarcity at the same time inside 38 states of rural Virginia. He used Gini-coefficient with a two-stage least square regression and cross-sectional data for the period of 1980 to 1990. Furthermore, OLS regression was used to analyze the important features of income inequality and scarcity. Results confirmed that there exist simultaneity between income scarcity and inequality. Results showed that the magnitude of residents in well-being, inhabitants who are 65 years of age or more, families that are headed by females, unemployment and inequality are the main reason and have greater effect on increasing poverty. [Ahmad \(2001\)](#) attempted to analyze income inequality among inhabitants of Pakistan associated with various occupations by utilizing (HIES 1992-1993) data by using SPSS. He made an attempt to calculate the Gini-coefficient in order to fill the gap among various occupations. After calculation, income inequality was compared among different occupations at provincial level. Within these different occupations the highest level of income disparity was amongst skilled labors and minimum level of income disparity was found between professionals. Similarly among various professions or occupations, highest level of income disparity was found in Khyber Pakhtunkhwa and lowest level of income inequality was observed in Baluchistan. [Oyekale et al. \(2004\)](#) stated that income inequality is harmful to economic development and economic progress. Few researchers in Nigeria, worked on income inequality and exposed the reasons of its rising in urban and rural areas. Attempt to measure level of income inequality in different areas by collecting of data from household through survey conducted by Federal Office of Statistics (FOS, 2003). Public policies tend to affect inequality mainly indirectly through their impact on growth and poverty ([Kayıkçı, 2019](#)). Using the average, standard deviation and coefficient of variance in order to explain that how household allocate their income, also used Gini-coefficient for the determination of income disparity among households. Data analysis by coefficient of variance and Gini-coefficient showed that the income was obtained from various sources i.e. agriculture, livestock, transfers, rental and non-farm source. For measuring the effects of socio-economic factors on per capita income OLS regression was used which is the rate of well-being. This technique was used to know the effects of each independent variable on income inequality. Used t-test and z-test was for testing presumed hypothesis. [Razak \(2006\)](#) worked on economic growth and income inequality by collecting the data from 46 countries in the time period of 1970-2000. The data was analyzed through Galor-zeria model in order to estimate the effects of variables. In accordance with the author results of Galor-zeria model of income inequality showed that increasing income inequality make difficult for the

people to spend money on schools which reduces futures earnings. The results showed that an increase in income inequality by 10 percent will reduce educational expenses by 7.1 percent and an increase in educational expenses by 10 percent will increase per capita income by 19.4 percent. Akmal et al. (2006) clarified interpretations about the relationship between income inequality and financial sector expansion with the reference that there were very few researchers worked on this area in less develop countries like Pakistan. Review of the previous research studies showed that increase in income inequality might due to development in financial sectors but when financial sector reaches to their maturity stage become reason for decreasing income inequality. Time series data from 1971 to 2005 was used which is necessary to study the relationship between financial sector development and income inequality in order to help policy makers to make such policies that doesn't affect income distribution negatively in less develop countries like Pakistan. Results showed that economic sector and fiscal growth are negatively related, which means that in Pakistan progress in economic sector reduces income inequality not only in short run but in long run as well. Economic instability increase gap between rich and poor in long run while having no effect in short run. This study gives recommendations to the policy makers for making good policies and to maintain economic stability in the country, equally distribute income and to strengthen middle class families in the research area.

In general, all the reviewed research studies related to income inequality carried out in various parts of the world mostly focused on measuring income inequality by using Lorenz curves, Gini-coefficient, Thiel's entropy measures, coefficient of variations, and Pareto-coefficient. The literature showed that income inequality is studied with different aspects. Previous studies like Ahmad (2001) analyzed income inequality between and within different occupations, Oyekale et al. (2006) researched income inequality and its relationship with poverty, Razak (2006) described income inequality and economic growth, Akmal et al. (2006) clarified income inequality and financial sector expansion. Similarly, Shams (2012) investigated income inequality in rural areas of Pakistan by using Thil index and Gini-coefficient approaches. Fatima (2012) investigated non-farm income and its relationship with non-farm activities in rural areas. Likewise, Huda (2017) determined income inequality and the factors that cause income inequality. However, the present study is different from the aforementioned studies that were carried out so far because; it's the first one in district Dir lower. The current study results assist economists and policy makers in understanding income distribution and major factors of income inequality in the selected area.

3. Research Methodology

3.1. Study Universe

District Dir lower was selected as the universe of the study, where three villages, including Ziarat, Shamshikhan, and Madinaabad, were randomly selected. The

total numbers of households in these villages are 1648 in the present study (Distt Council Office DIR Lower, 2021).

3.2. Sample Size & Sampling Techniques

Due to limited time and financial problems, 5% of the total households were selected from the population through the proportional allocation technique in the research area (Etikan & Bala, 2017). The respondents were interviewed in a proper way in order to get the maximum authentic information. Since the total number of households in the study area was 1648, so it's 5% is 82 households was our sample size (see **Table 1**). The following formula was used for selecting the number of samples taken from each village.

$$n_i = \frac{N_i}{N} \times n$$

where:

n_i = number of sample households in each selected village.

n = Total number of samples in the research area.

N = Total number of the households in the research area.

N_i = Total number of households in the targeted village.

3.3. Data Source

To meet the objectives of the research, the primary and secondary data source was taken. A comprehensive household questionnaire was designed to collect the overall information required in the study. Heads of households were interviewed directly; data was collected on the household's income and demographic information. While the information about the total number of households was taken from district council office Dir Lower (Distt Council Office DIR Lower, 2021).

3.4. Data Analysis

Data were gathered in excel for analysis. The tabulation and analysis of the data were conducted to compute the effects of various determinants like age, occupation, education, number of earners on income inequality in the research area. Also, the value of the Gini-coefficient was determined to know about income inequality in the research area.

Table 1. Distribution of sample households in the study area.

District	Name of village	Total number of households	Sample size
Dir (Lower)	Shamshikhan	616	31
	Ziarat	627	31
	Madinaabad	405	20
Total		1648	82

Source: Distt council office DIR Lower, 2021.

3.5. Measurement of Income Inequality

There is no single best method exists that is accepted universally for the measurement of income inequality. Generally, researchers use Gini-coefficient to measure income inequality because it is the best and suitable method that provides an absolute interpretation. Gini-coefficient as a measure of inequality was used by an Italian statistician and sociologist, Corrado Gini, in 1912.

3.5.1. Gini-Coefficient

Gini-coefficient is the most well-known measure of income inequality, which can be defined as the “Ratio of the area coming in the middle of absolute equality line and Lorenz curve to the overall area under the absolute equality line.” The following formula was used to calculate Gini-coefficient (Rao, 1969).

$$G = \sum_{i=1}^{n-1} (P_i q_{i+1} - P_{i+1} q_i)$$

where

P_i = cumulative share of the population;

q_i = cumulative share of income.

3.5.2. Lorenz Curve

Lorenz curve was used for graphical representation of income inequality. The cumulative percentage of the population was plotted on the X-axis, and the cumulative income percentage was plotted on the Y-axis. Lorenz curve shows the relationship between Percentage of population and Percentage of household income. The Lorenz curve is similar to the curve given by Bellù, and Liberati (2005) below, and computed for this study (see Figure 1).

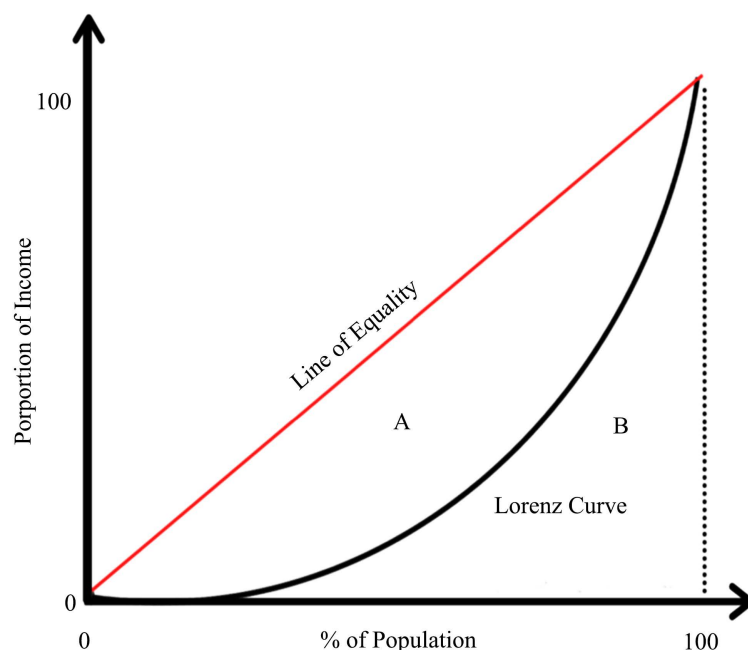


Figure 1. The Lorenz curve and equidistribution line. Source: Bellù, and Liberati (2005).

3.5.3. Palma Ratio

$$\text{Palma Ratio} = T10/B40$$

Palma ratio was also used in the present study. It shows the top 10% population income shares divided by the bottom 40% population income shares.

3.5.4. Logistic Regression Econometric Models

There are so many factors that influence income inequality, but from the review of literature, it is observed that age of household, education of household, number of earners, number of dependent members, remittances income of the household, and size of landholding are responsible for income variation among households in the rural areas. A logistic regression model was used to find factors influencing the income inequality of the households. If the dependent variables are dichotomous (“yes or no,” dummy variables), then the Logit model is the suitable one (Gujarati, 2006). Economic and non-economic characteristics of the household were used as the independent variables in the analysis, which were (age, education, number of dependent members, number of earners, and land holding size) of the respondents in the study area. So, as we are looking for explaining a binary status (i.e., income inequality or income equality), let the underlying dependent variable y^* be defined by the regression relationship (Gujarati, 2006; Tesfaye, 2004),

$$y^* = \beta_i X_i + \mu_i$$

where y_i^* is the income inequality of household, i is a set of coefficients for each independent variable, and X_i is the set of independent variables (determinants) while μ_i is used for the error term in the model. When y^* is unobservable, we only observe a dummy variable y explained by

$$y = 1 \quad \text{If } y^* > 0$$

And $y = 0$, otherwise.

Here, the response variable assumes two values, 1 if there is income inequality, 0 if not. The likelihood of the income inequality rests on a group of variables represented by X so that,

$$P(y_i = 1) = F(\beta X) \text{ and } P(y_i = 0) = 1 - F(\beta X)$$

A Logit model is applicable for qualitative binary variables that have two outcomes, i.e. $Y = 1$ if there is income inequality and $Y = 0$ if there is no income inequality. Therefore, our Logistic regression model is given by:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu_i$$

$Y = 1$ If income inequality exist and $y = 0$, otherwise;

X_1 = Age of household head (Years);

X_2 = Education of household head (Years);

X_3 = Earners of household (Numbers);

X_4 = Dependent members of the household (Numbers);

X_5 = Landholding size of household (Kanal);

μ_i = Error term;
 β_i = Co-efficients.

4. Results and Discussion

The study's main objectives were to measure income inequality and analyze the determinants of income inequality of the household in the study area. The study was conducted in three villages of Talash region district Lower Dir namely Madinaabad, Shamshikhan, and Ziarat. This section includes the main findings of the study regarding demographic characteristics of the households in the area and also contains some experimental results about Gini-coefficient and analysis of the main factors of the household's income.

4.1. Characteristics of the Respondents in the Study Area

This section includes characteristics of the households in the selected area responsible for income inequality, such as landholding, family type, literacy status, family size, number of earners, and occupation of the selected area.

4.1.1. Family Type

There is a great connection of family type with household income. **Figure 2** explains three types of families living in the research area. In Madinaabad, 55% of the respondents were living in nuclear family 35% were living in Joint families, and only 10% were living in an extended family system. In village Shamshikhan, 51.6%, 41.9%, and 6.5% of the household were living in nuclear, joint, and extended family systems, respectively. In Ziarat village, 45.2%, 45.2%, and 9.7% of the households were living in nuclear, joint, and extended family systems severally, which is given in the figure below.

4.1.2. Occupations of the Sampled Household

Most of household were connected with various occupations which is shown in **Figure 3**. In Madinaabad village 25% of the sample household were labor, 35% were farmer, 5% were engaged with business sector and 35% of the sampled household were engaged with services. In Shamshikhan 25.8% of household

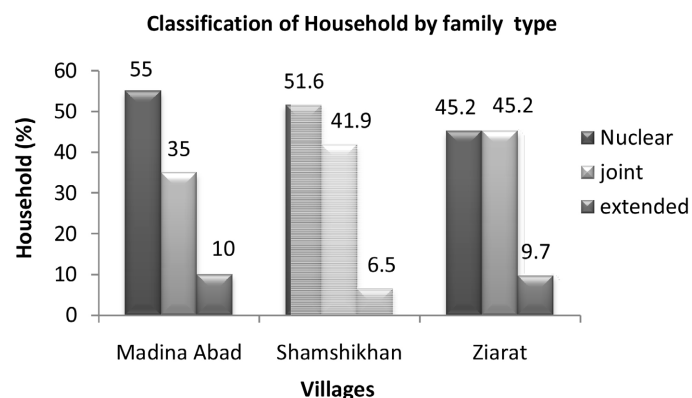


Figure 2. Household distributions according to family type. Source: Author generated.

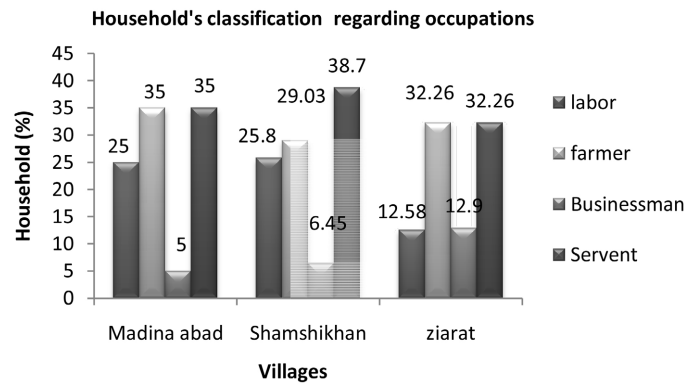


Figure 3. Household's classification according to their occupations. Source: Author generated.

were labor, 29.03 were farmer, 6.45% were businessman and 38.7% were obtained their income from services while in Ziarat village 22.58% were labor, 32.26% were farmer, 12.9% were businessman and 32.26% of the household obtained their income from services.

4.1.3. Literacy Status of Household

Education plays an important role in the development of financial activities, as an educated person is considered more skilful and efficient to learn new ideas as compared to uneducated person. It is supposed that a higher level of education increase the level of output in term of a different behavior. **Figure 4** showed that 45%, 51.6% and 64.5% of the household's head in village Madinaabad, Shamshikhan and Ziarat were literate, respectively. While 55%, 48.4% and 35.5% of the household's head in village Madinaabad, Shamshikhan and Ziarat were illiterate respectively.

4.1.4. Family Size of Household

Family sizes of household were divided into four class interval i.e., 2 - 4, 5 - 7, 8 - 12 and above 12 members. **Figure 5** explained that 40% of households in Madinaabad, 45.1% in Shamshikhan and 16.13% in Ziarat include 2 - 4 members. Similarly 30% of the sampled household's in Madinaabad 22.58% in Shamshikhan and 29.03% in Ziarat were living with a household size of 5 - 7 members. 25% in Madinaabad, 25.8% in Shamshikhan and 45.16% of the households were living with a family size of 8 - 12, while 5% of the households in Madinaabad 6.45% in Shamshikhan and 9.67% in Ziarat village were living with the family size of more than 12 members. The figure further revealed that in total 32.92%, 26.83%, 32.92% and 7.31% of the sampled household's was living with family size of 2 - 4, 5 - 7, 8 - 12 and above 12 members respectively.

4.1.5. Household's Age

Age is an important determinant of the household income; more of young age members of a household mean more of the energetic labor force which causes increase in household income. Age of the household's heads were systematically

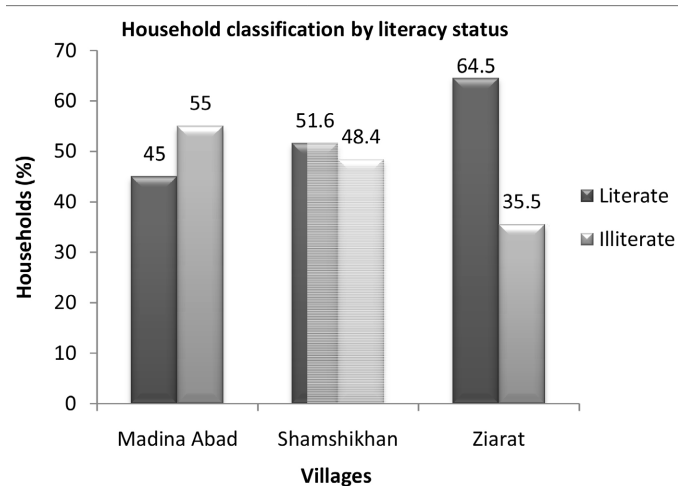


Figure 4. Classification of household by literacy status. Source: Author generated.

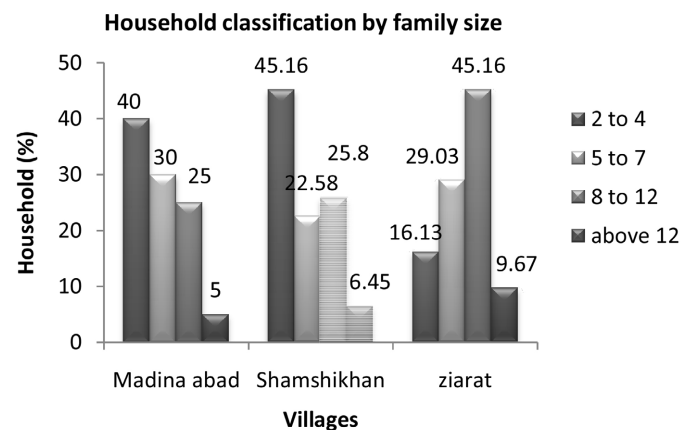


Figure 5. Household classifications by family size. Source: Author generated.

divided into four class intervals that were 20 - 30, 31 - 40, 41 - 50 and above 50. **Figure 6** showed that in Madinaabad village 20% of the households were having 20 - 30 years of age, 10% were aged among 31 - 40 years of age, 40% of the sample household's were having the age of 41 - 50 years, while 30% of the household's head were having age above 50 years. Similarly, in Shamshikhan 16.12%, 25.8%, 25.8% and 32.25% of the household's heads were having the ages of 20 - 30, 31 - 40, 41 - 50 and above 50 years, respectively. In Ziarat village 3.22%, 19.35%, 32.25% and 45.16% of the household's heads were the ages of 20 - 30, 31 - 40, 41 - 50 and above 50 years, respectively. Furthermore the data showed that 12.19% of the total sampled household's were having age between 20 - 30 years 19.51% were 31 - 40 years old, 31.7% were 41 - 50 years old and 36.58% of the sampled respondents were having above 50 years of age.

4.1.6. Number of Earners

Number of earners in a family has a direct relation with their income. As the number of earners increase, income of the household increases and vice versa. In **Figure 7** the data revealed the number of earners of household in the selected

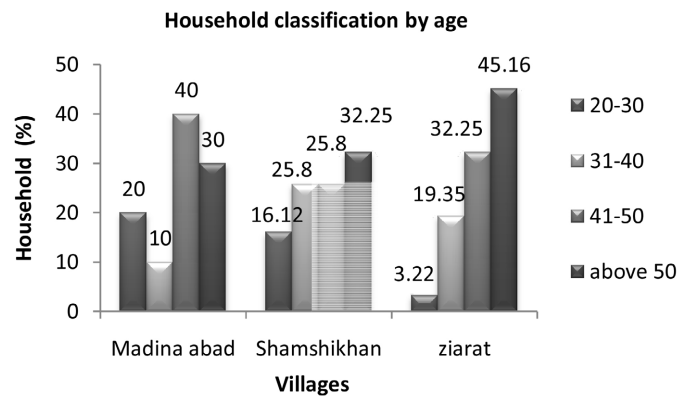


Figure 6. Household classifications by age. Source: Author generated.

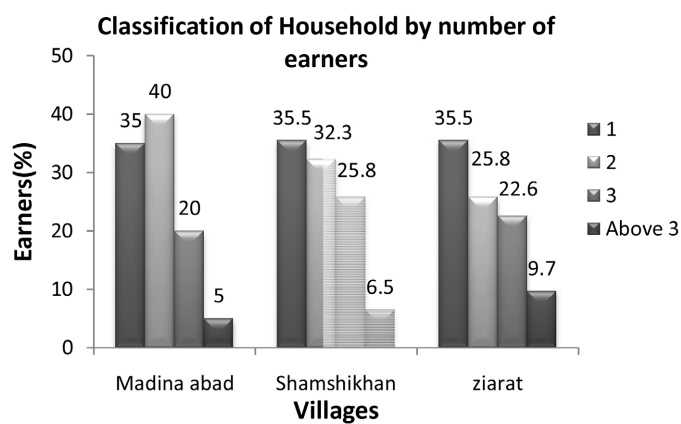


Figure 7. Household classifications by number of earners. Source: Author generated.

area. In Madinaabad 35%, 40% and 20%, of the sampled households have one, two and three number of earners respectively while 5% of the households have 4 and above earners. Similarly in Shamshikhan 35.5%, 32.3%, 25.8%, and 6.5% of households were one, two, three and above three earners respectively. Further the data revealed that in Ziarat 29%, 38.7% and 22.6% of families have one, two and three number of earners respectively while 9.7% of the household have above three earners. The data also showed that 36.6% of the total selected households have two numbers of earners followed by the families with one earner and three earners respectively, while only 7.3% of the total selected households have more than three earners.

4.1.7. Land Ownership of the Household

Land is free gift of nature in a limited supply. Due to limited availability of fertile land in rural areas people tends towards non-farm activities. In Figure 8 households were classified into five different group's i.e., landless and household that owned 1 - 10, 11 - 20, 21 - 30 and above 30 kanal of the land. Data showed that in Madinaabad village 50% of the households were landless while 25%, 20%, and 5% of the sampled household's owned 11 - 20, 21 - 30 and above 30 kanal of land respectively. In Shamshikhan 38.7% of the sampled households were landless

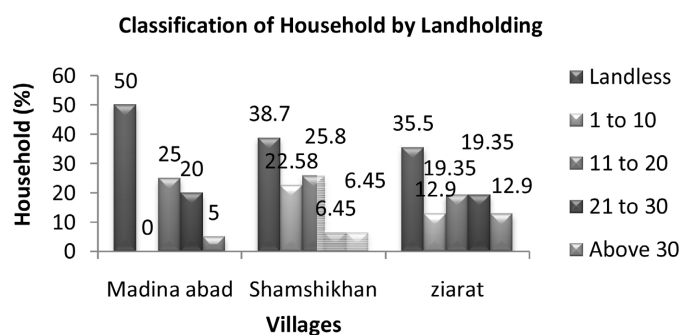


Figure 8. Classification of household by landholding. Source: Author generated.

22.58%, 25.8%, 6.45% and 6.45% household's having land ownership of 1 - 10, 11 - 20, 21 - 30 and above 30 kanal respectively. Similarly in Ziarat 35.5% of the respondents were landless while 12.9%, 19.35%, 19.35% and 12.9% owned 1 - 10, 11 - 20, 21 - 30 and above 30 kanal of land. Data also revealed that in total 40.2% of the sample respondents were landless followed 23.2%, 14.6% and 13.4% having 11 - 20, 21 - 30 and 1 - 10 kanal land respectively. Only 8.5% of the total respondents were having land above 30 kanal.

4.2. Empirical Results

This section includes the results that are estimated for the measurement of income distribution in the study area.

4.2.1. Gini-Coefficient and Palma Ratio for the Selected Household

Gini-coefficient measures the distribution of income among the population. It shows economic inequality in a population and cost allocation. Closer the distribution better will be living condition of the people and more dispersed the distribution represent high poverty ratio in the selected area. When the Gini-coefficient is less than 0.2, it represents perfect income equality, value 0.2 - 0.3 shows relative equality, Gini-coefficient with value 0.3 - 0.4 shows adequate equality, when the value of Gini-coefficient is between 0.4 - 0.5 this situation is called big income gap while when Gini-coefficient exceeds 0.5 this situation is called severe income gap.

Outcome of the data in the table revealed the value of Gini-coefficient in the research area. Table showed that the value of Gini-coefficient for villages Madinaabad, Shamshikhan and Ziarat were 0.22, 0.30 and 0.34 respectively. Similarly for the total selected households in the study area Gini-coefficient was 0.31. Results are nearly related with [Qureshi and Sadozai \(2016\)](#) whose Gini-coefficient value for khyber pakhtunkhwa province rural areas was 0.35 and also matching with [Usman et al. \(2016\)](#) who give minimum Gini-coefficient of 0.29 and highest 0.37 in rural areas.

Palma ratio is another method to measure income inequality by simple ratio of the income share between the populations. It focuses on the tails of inequality and also responds to extreme inequality. For some economist it is very impor-

tant because they are focusing to make policies about uplifting of the poorest 40% of the population. **Table 2** showed Palma ratio for the villages and for the overall selected area. The Palma ratio for villages Madinaabad, Shamshikhan, Ziarat and for overall area was 0.63, 0.88, 1.14 and 1.06 respectively. Ziarat have highest Palma ratio (1.14), means that richest 10% population of Ziarat village have 1.14 times of income that poorest 40% population have, following by Shamshikhan while Madinaabad have the lowest Palma ratio among the three villages. Results are nearly related with **Tahsin (2019)** whose results for Palma Ratio were ranges from 2.17 to 1.68 during the period 2002 to 2017.

4.2.2. Representation of Income Inequality by Lorenz Curve

Lorenz curve is used for determining variability of income distribution. It measures the standard deviation of an actual distribution from the line of equality. The difference between actual distribution of income and the line of equality or hypothetical distribution is known as Gini-coefficient. The greater value of Gini-coefficient the greater will be inequality in distribution of income. Lorenz curves below explained the distribution of income in the villages Madinaabad, Shamshikhan, Ziarat and in overall area by **Figures 9-12** respectively. Cumulative percentage of household income is taken on Y-axis while cumulative percent of income is taken on X-axis. As the Gini-coefficient of Madinaabad is close to zero therefore the Lorenz curve showed little dispersion from the line of equality while in the case of Ziarat village it shows high deviation from the equality line. **Amir and Bilal (2011)** also used Lorenz curve to determine the distribution of income among the population.

4.3. Estimated Coefficients of Binary Logistic Regression Model for Income Inequality and Its Discussion

Identifying the particular factors influencing the living standard of the community is vital in designing development policies and in enhancing the applicability or correctness of interventions. In order to analyze income inequality determinants of households, both economic characteristics like landholding size owned by household and non-economic characteristics like age of the household head, education of the household head, number of earners in household, and number of dependants in the household were used.

Table 2. Gini-coefficients and Palma ratio.

Name of village	Total income of Respondents	Average income of Respondents	Standard Deviation	Gini-coefficients	Palma Ratio
Madinaabad	630,000	31500.00	12220.561	0.22	0.63
Shamshikhan	1,268,300	40912.90	21405.992	0.30	0.88
Ziarat	1,410,700	45506.45	29939.661	0.34	1.14
Overall	3,309,000	40353.66	21010.440	0.31	1.06

Source: Field survey 2021.

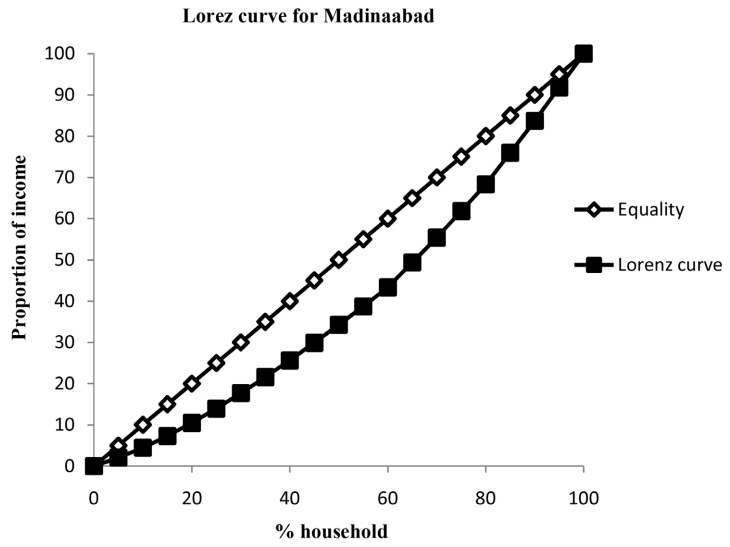


Figure 9. Lorenz curve for Madinaabad. Source: Author generated.

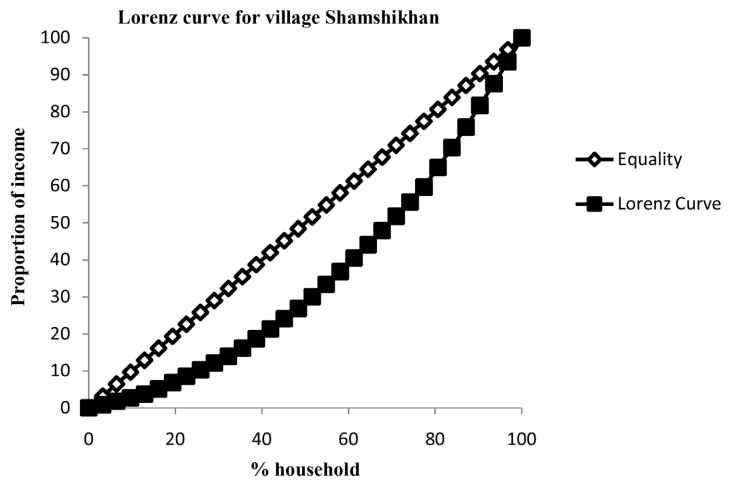


Figure 10. Lorenz curve for Shamsikhhan. Source: Author generated.

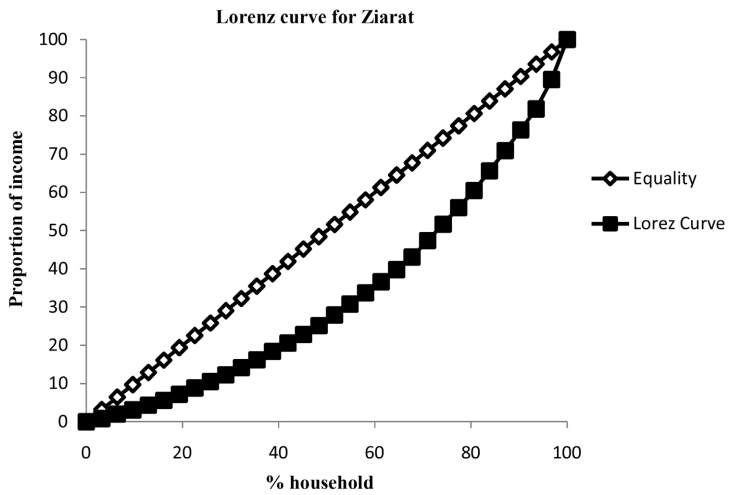


Figure 11. Lorenz Curve for Ziarat. Source: Author generated.

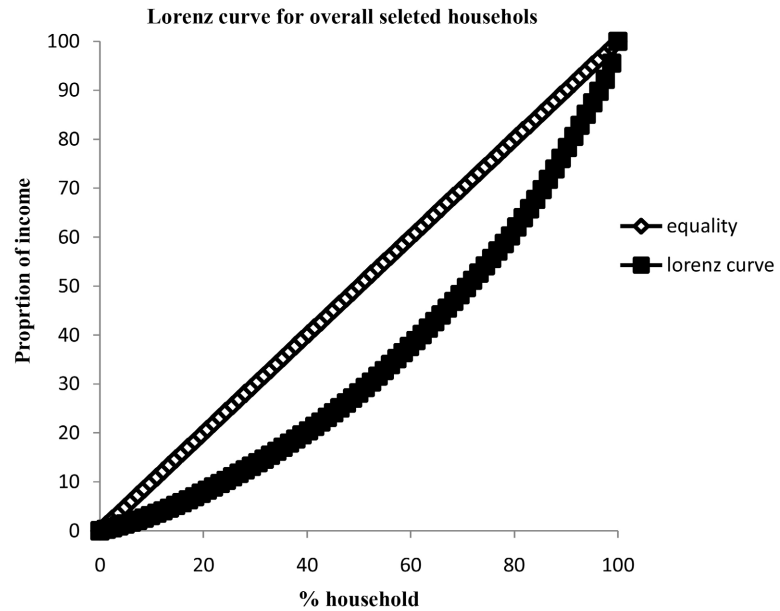


Figure 12. Lorenz curve for overall selected household. Source: Author generated.

A binary Logit model was applied to analyze the determinants of income inequality of the households in the study area. The result estimates of the parameter analysis were as expected and in line with the results determined by other researchers relevant to the present study. **Table 3** showed that the age of the household head was statistically significant at the five percent level where p -value was 0.039. In contrast, the education of the household head and the number of earners was p -value 0.002 and 0.007, respectively, which was statistically significant at one percent level. Similarly, number of dependents was statistically significant by ten percent.

The odds ratio investigates the association between the independent variable and categorical dependent variable. It is the logarithmic value of odds and always gives a positive value. It is the exponential function of regression coefficients. The odds ratio of age was 1.084. This shows that other variables remain constant; one year increase in the age of sample respondents was more likely of income inequality than income equality by 8.4 percent. The value of the odds ratio for education was 0.862, which shows that one year increase in the education household head leads to decreasing income inequality rather than income equality by 13.8 percent. The results for the variable age are opposite, while variable education is similar to the empirical results of (Teka et al., 2019) as he studied determinants of poverty age and education level and obtained the odds ratio 0.999 and 0.961 insignificant and significant, respectively. The result of the study for variable education is also related to (Debebe & Zekarias, 2020). There is an inverse relationship between income inequality and poverty (Joshi & Gebremedhin, 2012). The odds ratio of the variable number of earners was 0.306, which showed that an increase of one earner in a household decrease income inequality instead of income equality by 69.4 percent. The odds ratio for the number of

Table 3. Estimated coefficients of binary logistic regression model for income inequality.

Income inequality	Coefficient	S. E.	p-Val	Odds ratio
Age	0.084	0.039	0.039	1.084
Education	-0.138	0.047	0.002	0.862
No. of earners	-0.694	0.440	0.007	0.306
No. of dependents	-0.215	0.145	0.096	0.785
Land holding size	-0.002	0.026	0.928	0.998
Constant	0.838	1.160	0.470	2.313

Source: Field survey 2021.

dependents was 0.785 shows that the increase of one dependent member decreases income inequality rather than income equality by 21.5 percent. However, the magnitude of the significance of the variable “number of dependents” slightly affects the income inequality, therefore in a few households, the inequality decreases with the number of dependents.

5. Summary, Conclusion and Recommendations

Many researchers tried to find out the determinants of income inequality in developing countries. Such a type of empirical study is an effort to identify the identification of nature and character of income inequality within a region. The objective of the present study was to measure income inequality in the area and to determine factors of the income inequality of households in the study area.

5.1. Summary

The present study was conducted in three selected villages of the Lower Dir district. Five percent sample was taken randomly through proportional allocation technique. Gini-coefficient and Palma ratio (Palma, 2016) were used to measure income inequality, while for determinants of income of the household, robust regression as an alternative of ordinary least square was used. Lorenz curves were used for graphical representation of income inequality of households in the study area.

The results study revealed that people living in the area have three types of families. In the overall study area, 50% of the respondents lived in the nuclear family system, 41.5% lived in Joint families, and only 8.5% lived in the extended family system. The literacy status of households head in the study area showed that 54.9% of the total sampled households were literate while 45.1% were illiterate.

Information about total income showed that in Madinaabad, the mean overall income of the sample respondents was Rs.31500 ranged from Rs.13000 to Rs.51500. In Shamshikhan, the average overall income was Rs.40912.9 ranged from Rs.11000 to Rs.82000, while in village Ziarat the average value of overall

income was Rs.45506.45 ranged from Rs.12000 to Rs.148000. Results of farm income for the villages revealed that Madinaabad was Rs.10688.6, minimum income was Rs.1500, and maximum income was Rs.20000. For the village, Shamshikhan mean farm income was Rs.9338.4 ranged from Rs.2000 to Rs.27000. Similarly, for village Ziarat mean farm income was Rs.13718.52, where maximum income was Rs.36500, and minimum income was Rs.2000. The results of non-farm income for villages were that in Madinaabad, the mean non-farm income was Rs.24111.1, ranging from Rs.6000 to Rs.46000. For village Shamshikhan non-farm income mean was Rs.34366.6 and it was ranged from Rs.2000 to Rs.76000. The average income for Ziarat was Rs.34676.6 ranged from Rs.3000 to Rs.127000.

Results for the variable number of earners of households in the selected area revealed that 32.9%, 36.6%, and 23.2% of the sampled households have one, two, and three earners, respectively, while only 7.3% of the households have four and above earners. Similarly, results for landholding in the study area revealed that in total, 40.2% of the sample respondents were landless, followed by 23.2%, 14.6%, and 13.4% having 11 - 20, 21 - 30, and 1 - 10 Kanal land, respectively. Only 8.5% of the total respondents had land above 30 Kanal.

Statistical results showed that the value of Gini-coefficient for villages Madinaabad, Shamshikhan, and Ziarat was 0.22, 0.30, and 0.34, respectively. Similarly, for the total selected households in the study area, Gini-coefficient was 0.31. The Palma ratio for villages Madinaabad, Shamshikhan, Ziarat, and the overall area were 0.63, 0.88, 1.14, and 1.06, respectively. Lorenz curves were used to explain the income distribution among the villages Madinaabad, Shamshikhan, Ziarat, and overall area by **Figures 9-12** respectively.

Results of binary logistic regression for the data revealed that the age of the household head was statistically significant at the five percent level, while the education of the household head and the number of earners was statistically significant at the one percent level. Similarly, the number of dependents was significant at ten percent. The odds ratio of age was 1.084 shows that other variables remain constant. One year increase in the age of sample respondents was more likely of income inequality rather than income equality by 8.4 percent. While education, number of earners, and number of dependents decreases the income inequality by 13.8 percent, 69.4 percent, and 21.5 percent, respectively. However, the magnitude of the significance of the variable “number of dependents” slightly affects the income inequality, therefore in a few households, the inequality decreases with the number of dependents.

5.2. Conclusions

The present study focuses on the key factors of income inequality in the study area. Economic and demographic characteristics of the household were included in the data. It was concluded that several factors affect the income of the households in the study area. Results revealed that people living in the area have three types of families, nuclear, joint, and extended family systems. The literacy status

of households in the study area showed that more than half of the total sampled households head were literate where the highest literacy was in the village ziarat. It was also concluded that the average non-farm income of Ziarat village was higher as compared to Shamshikhan and Madinaabad similarly the average farm income for Ziarat village was high as compared to Madinaabad and Shamshikhan. The data also showed that 36.6% of the total selected households have two numbers of earners followed by the families with one earner and three earners respectively, while only 7.3% of the total selected households have more than three earners.

The value of the Gini-coefficient in Ziarat was the highest which was followed by Shamshikhan and Madinaabad respectively. Similarly Palma ratio for village ziarat was the highest followed by Shamshikhan and Madinaabad. Lorenz curves were constructed to represent the income distribution among the villages Madinaabad, Shamshikhan, Ziarat, and the overall area which showed that income inequality for village Ziarat was the highest.

Results of binary logistic regression showed that the odds ratio of age education and the number of dependents respectively showed that income inequality increases with the increase of one year of age by 8.4 percent, while education and number of earners decrease the income inequality by 13.8 percent and 69.4 percent respectively. However, the magnitude of the significance of the variable “number of dependents” slightly affects the income inequality, therefore in a few households, the inequality decreases with the number of dependents.

5.3. Recommendations

In the light of study findings following recommendations are made.

- 1) The study concluded that education level reduced income inequality in the study area; therefore, education level should be improved to reduce income inequality in the study area.
- 2) As we know from the results, the age of the household head has positively related to income inequality; therefore, aged citizens should be encouraged by allowing them to do what they can while helping just enough to complete their goals.
- 3) Results of the study showed that the household’s farm income is low compared to non-farm income. To enhance agricultural productivity, the farmer needs to utilize land resources properly.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Interview Schedule

Measurement of Income Inequality and its Determinants in District Dir Lower

Date: / /2021

1) Name of Household head: _____

2) Address: _____

3) Age of Household head: _____ (Years)

4) Education: _____ (Years)

5) Size of Household: _____

6) Household Type:

➤ Nuclear _____

➤ Extended _____

7) No of earners _____

8) No of dependents _____

9) Occupation of earners: _____

10) Land holding size _____ (kanals)

11) Sources of income:

I) Farm Income: i. Yes (), ii. No ()

➤ Crop Income _____ (Rs)

➤ Livestock _____ (Rs)

➤ Forest Income _____ (Rs)

➤ Rental Income of Land _____ (Rs)

➤ Farm Machinery Income _____ (Rs)

➤ Daily Wage Income _____ (Rs)

II) Non-Farm Income i. Yes (), ii. No ()

➤ Services income _____ (Rs)

➤ Business Income _____ (Rs)

➤ Remittances income _____ (Rs)

➤ Rental income _____ (Rs)

➤ Transfer income _____ (Rs)

➤ Daily Wage income _____ (Rs)