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Who is Deprived and Why? Understanding Regional Disparities in Multidimensional Poverty Across Agro-Climatic Zones in Punjab

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Abstract

Multidimensional Poverty Index reflects the multifaceted nature of poverty that goes beyond merely income through incorporating multiple deprivations that people experience simultaneously. While the inequalities in living standards between high-income and low-income countries are widely recognized, the causes of these discrepancies are still debated, with geography and institutional frameworks frequently cited as key determinants. Influenced by a variety of structural and contextual elements, the composition and extent of poverty can vary significantly depending on the geographical location. Particularly in areas with high levels of deprivation, understanding regional variations in multidimensional poverty can provide key insights into the factors leading to deprivation and help develop targeted initiatives for the eradication of poverty. This study uses data from the Pakistan Social and Living Standards Measurement Survey and employs the Alkire-Foster method to explore the spatial distribution of multidimensional poverty across agro-climatic zones in Punjab, Pakistan. Furthermore, the study evaluates the validity of poverty estimates across multiple dimensions using four different weighting structures. The results support earlier findings regarding Barani Punjab, which continues to be the least deprived region even when assessed from a multidimensional perspective. This study, however, identifies Low Intensity Punjab as the most deprived region in a multidimensional context, in contrast to earlier studies that focus on income-based poverty measures. A thorough examination of the Multidimensional Poverty Index reveals that, while their relative significance varies by region, deprivations in cooking fuel, years of schooling, health, housing, and sanitation significantly contribute to overall poverty across all zones in Punjab. These results highlight the need for policy interventions that are tailored to specific region, with a focus on allocating resources to the most critical dimensions that have the greatest contribution in overall poverty.

Keywords: Multidimensional Poverty; Agro-Climatic Zones; Geography of Poverty; Regional Disparities; Punjab.

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Introduction

There are significant variations in income and the standard of living between and within nations. Sub-Saharan Africa, for instance, has an average per capita income that is less than one-twentieth of the US average. Similarly, the disparities within countries are also striking. In Pakistan, for example, the rates of multidimensional poverty reveal a significant gap between rural and urban areas, with 9.4 percent of the urban population and 54.6 percent of the rural population identified as multidimensionally poor (Pakistan Economic Survey, 2015–16). In Punjab, these disparities are still apparent, with multidimensional poverty affecting 6.3 percent of the urban population compared to 43.7 percent of the rural population. These regional and spatial inequalities raise critical questions about the fundamental causes of poverty, especially in economically challenged areas where markets are inefficient, educational levels are low, and technological progress is limited. While these factors contribute to ongoing poverty, they are more immediate causes rather than the root drivers, leading to a need for a deeper exploration of the underlying mechanisms that persists regional disparities.

Two main theoretical perspectives are frequently referenced to explain these regional differences in poverty and economic success: geography and institutions. The geography hypothesis suggests that climatic and ecological factors influence technological development and economic incentives, thereby affecting long-term prosperity. Classical economists like Alfred Marshall (1890) stressed the importance of climate in determining productivity and human vitality, while Myrdal (1968) pointed out how geographic conditions impact agricultural productivity and living standards.

According to the institutional perspective, man-made institutions rather than geographic factors are primarily responsible for the disparities in economic development. The rule of law is often upheld, investments in human and physical capital are encouraged, and broad involvement in political and economic activity is made possible in societies with strong institutions. In regions that are economically marginalized, weak institutions often lead to limited access to essential services, fewer job opportunities, and restricted social mobility, which in turn perpetuates poverty across generations.

The idea of spatial poverty, which highlights the concentration of deprivation in certain areas due to unfavorable conditions like poor infrastructure, environmental challenges, or political exclusion, has become a focal point in recent academic discussions. Approximately 1.8 billion people globally live in low-potential and marginalized areas, with nearly one billion residing in urban slums. In Pakistan, there is a significant spatial aspect to poverty, characterized by notable disparities both between and within provinces, along with a distinct geographic concentration of deprivation (Fatima, 2015).

While much of the current research on multidimensional poverty in Pakistan has concentrated on rural-urban differences, it is crucial to explore poverty trends beyond these broad categories. Agricultural productivity, cropping patterns, and livelihood strategies differ greatly across agro-climatic zones, which calls for a more detailed examination of regional poverty. Over 60 percent of Pakistan's population lives in rural areas, heavily depending on agriculture for their livelihoods. The variations in poverty levels across regions can be partly explained by differences in agricultural productivity, which are influenced by seasonal cropping patterns. The two main cropping seasons in Pakistan, Kharif and Rabi, dictate the cultivation of essential crops such as rice, cotton, maize, and sugarcane during Kharif, and wheat, barley and oilseeds during Rabi.

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This study intends to understand how multidimensional poverty is spread throughout different agro-climatic zones in Punjab, Pakistan. As the most agriculturally important province in the country, Punjab shows great ecological and geographic variability. It is classified into five agro-climatic zones: Barani Punjab, Low Intensity Punjab, Mixed Punjab, Cotton-Wheat Punjab, and Rice-Wheat Punjab (Pinckney, 1989). This classification is mostly based on Kharif cropping patterns, with wheat being the principal Rabi crop in all locations. Given ecological diversity of the Punjab, it is essential to factor this variety into poverty assessments. While geographic conditions cannot be changed, policies can be developed to alleviate their negative impacts through multidimensional strategies that enhance institutional support and service delivery. Therefore, understanding the geographic and ecological aspects of poverty is vital for creating effective interventions and ensuring that resources are allocated efficiently for poverty alleviation.

Objectives of the Study

The objective of the study is to investigate the extent and composition of multidimensional poverty across agro-climatic zones in Punjab, Pakistan. The study aims to provide a comprehensive assessment of deprivation patterns, thereby improving our knowledge of spatial poverty variations considering the ecological and economic diversity of the province. The specific objectives are:

1. Estimate the incidence and severity of multidimensional poverty in the Punjab Province.
2. Analyze the composition of poverty across various agro-climatic zones in the Punjab Province.
3. Based on the findings, suggest policy recommendations which address variations in regional poverty.

Review of Literature

Highlighting geographical variations, many studies have examined poverty in Pakistan's. Malik (1992), Arif and Ahmad (2001), Malik (2005), and Irfan (2008) are notable early works that investigated regional differences using several poverty measuring techniques. Pickney's (1989) classification of agro-climatic zones and household surveys conducted by the Federal Bureau of Statistics (FBS) were the primary sources of data for these studies. Based on these studies, Barani Punjab consistently showed the lowest estimates of poverty. However, the ranks of other regions changed across different periods of time.

Malik (1992) for instance claims that Cotton/Wheat Punjab, Baluchistan, and Rice/Other Sindh had the greatest rates of poverty in 1984–85. While, Low Intensity Punjab came out as the poorest area by 1987–1988; Cotton/Wheat Punjab came second, then Rice/Other Sindh. Later, Arif and Ahmad (2001) discovered that in 1993–1994 and 1998–1999 Rice/Wheat Punjab and Cotton/Wheat Sindh were the most deprived areas. Barani Punjab continued to be the least deprived zone, whereas Baluchistan was identified as the area with the highest rates of poverty, followed by Low Intensity Punjab, according to more current data from the Household Income and Expenditure Survey (HIES) for 2007–08 (Fatima, 2015). Likewise, Malik (2005) pointed out that in 2001-02, Southern Punjab and Sindh were the most deprived areas in Pakistan. Using the official poverty line based on the Pakistan Social and Living Standards Measurement Survey (PSLM) 2004-05, Irfan (2008) found that Cotton/Wheat Punjab had the highest poverty rates, followed by the province of NWFP (now Khyber Pakhtunkhwa) and Low Intensity Punjab.

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In addition to agro-climatic classifications, different regional classifications of Punjab have been used in poverty analyses. The Federal Bureau of Statistics (FBS) divided Punjab into Northern, Central, and Southern regions, revealing that Northern Punjab had the lowest poverty levels, while Southern Punjab—encompassing Barani Punjab and Cotton/Wheat Punjab—exhibited the highest poverty rates (GoP, 2003). Gazdar et al. (1995) observed similar trends by categorizing Punjab into northern and southern regions. Cheema (2008) highlighted districts like Attock, Lahore, Gujrat, Chakwal, Rawalpindi, Jhelum, and Sialkot as having the lowest poverty rates in Punjab, with four of these located in Barani Punjab. These results are consistent with broader socio-economic rankings of districts (Jamal et al., 2003).

While earlier studies have primarily concentrated on one-dimensional measures of poverty, it remains uncertain whether the structure of multidimensional poverty reflects similar trends. If multidimensional poverty significantly diverges from income-based assessments, conventional poverty alleviation strategies might not adequately address the full range of deprivations. This study seeks to address this gap by examining the multidimensional aspects of poverty across agro-climatic zones in Punjab, offering a more thorough evaluation of regional disparities in deprivation.

Methodology and Data

In order to assess and analyze deprivations, Alkire and Foster (2007) introduced the Multidimensional Poverty Index (MPI). Because MPI mandates that all indicators come from a single survey, the PSLM Survey from 2019–20 was used in this study. In order to investigate the prevalence of multidimensional poverty in various agro-climatic zones, this study uses Pickney's (1989)[1] agro-climatic zone classification.

Selected Dimensions and Their Cut-Offs

This study's approach to measuring deprivations is rooted in Sen's Capability Approach (Sen, 1986), which highlights that poverty encompasses more than just income; it also involves an individual's ability to function and achieve well-being across various dimensions. Although there is ongoing debate among advocates of this approach about which dimensions to include, this study adheres to the framework established by Alkire and Foster (2007), focusing on three primary dimensions: Education, Health, and Living Standards. These dimensions are further divided into ten specific indicators, offering a thorough assessment of multidimensional poverty.

Issue of Weights

Once the dimensions are chosen, a significant challenge in constructing the Multidimensional Poverty Index (MPI) is determining the weights for each dimension. These weights indicate how important each dimension is in the overall assessment of poverty. However, assigning weights is a subjective method that raises potential bias issues. Some studies address this tissue by using identical weights (Alkire and Foster, 2012), which imply that each dimension is equally important. This approach might not always be appropriate, though, as some dimensions or indicators may be more important in particular situations and ought to be given priority.

In order to investigate this further, this study estimates three models with different weighting schemes:

[1] Details of agro-climatic zones and their districts are presented in Table-1 in Appendix-A.

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- Model 1: Giving education 50% of the weight and health and living standards 25% each.
- Model 2: Giving health 50% of the weight and education and living standards 25% each.
- Model 3: Giving living standards 50% of the weight and education and health 25% each.

Interestingly, the results obtained from these three models showed no significant difference, suggesting that the choice of weighting scheme does not drastically alter the outcomes in this case.

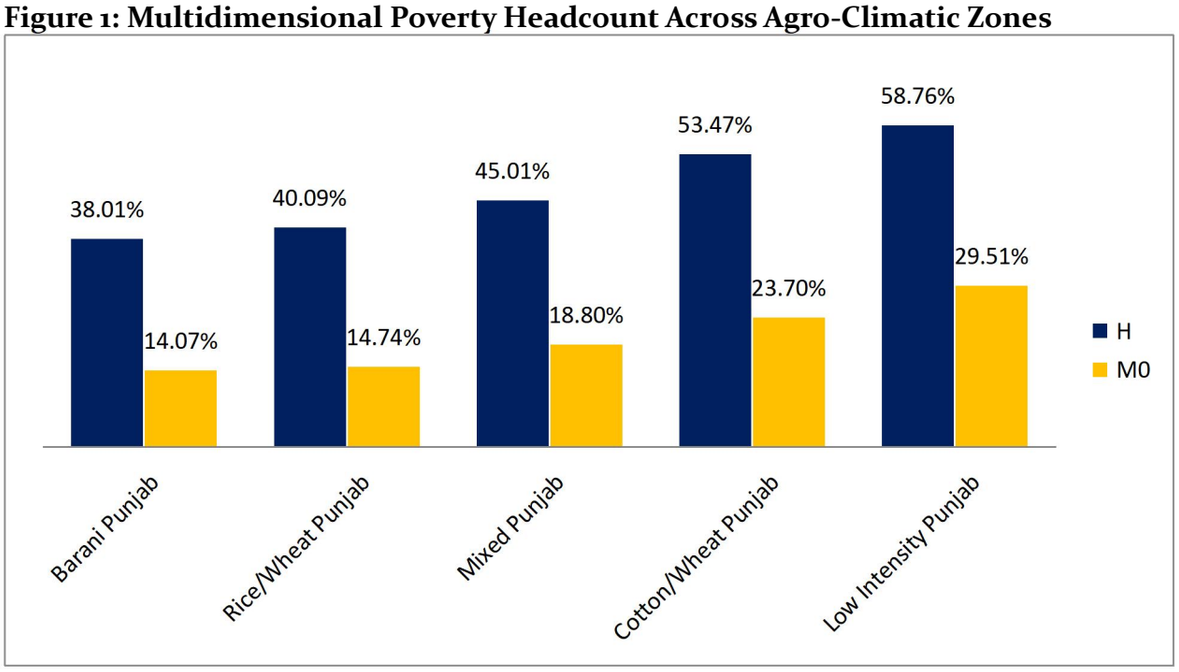
This result shows the adaptability of the MPI methodology, enabling modifications according to the specific policy objectives or empirical concerns of a particular study. This flexible strategy guarantees the MPI's efficacy in a variety of applications by allowing it to be tailored for various policy circumstances.[2]

Results

The results in this section are based on equal weights across the three dimensions. However, results with varying weights can be found in Appendices C, D, and E. This study aligns with previous research, particularly regarding Barani Punjab, which remains the least deprived zone even in a multidimensional context. In contrast, it diverges from several other studies, especially concerning other regions. In this analysis, Low Intensity Punjab is recognized as the most deprived zone, differing from earlier studies that identified Cotton/Wheat Punjab as the most deprived (Malik, 1992), followed by Rice/Wheat Punjab (Arif and Ahmed, 2001).

The agro-climatic zones are ranked from least to most deprived in the assessment of multidimensional poverty. Barani Punjab, where 38% of households live in multidimensional poverty, is followed by Low Intensity Punjab, Rice/Wheat Punjab, Mixed Punjab, and Cotton/Wheat Punjab. Low Intensity Punjab exhibits low cropping intensities, which add to the region's higher levels of impoverishment, even though it is located on the left bank of the Indus River, where irrigation infrastructure is less established.

Figure 1: Multidimensional Poverty Headcount Across Agro-Climatic Zones



[2] The details of dimensions and indicators along with their respective weights are given in Table-3 in Appendix-B.

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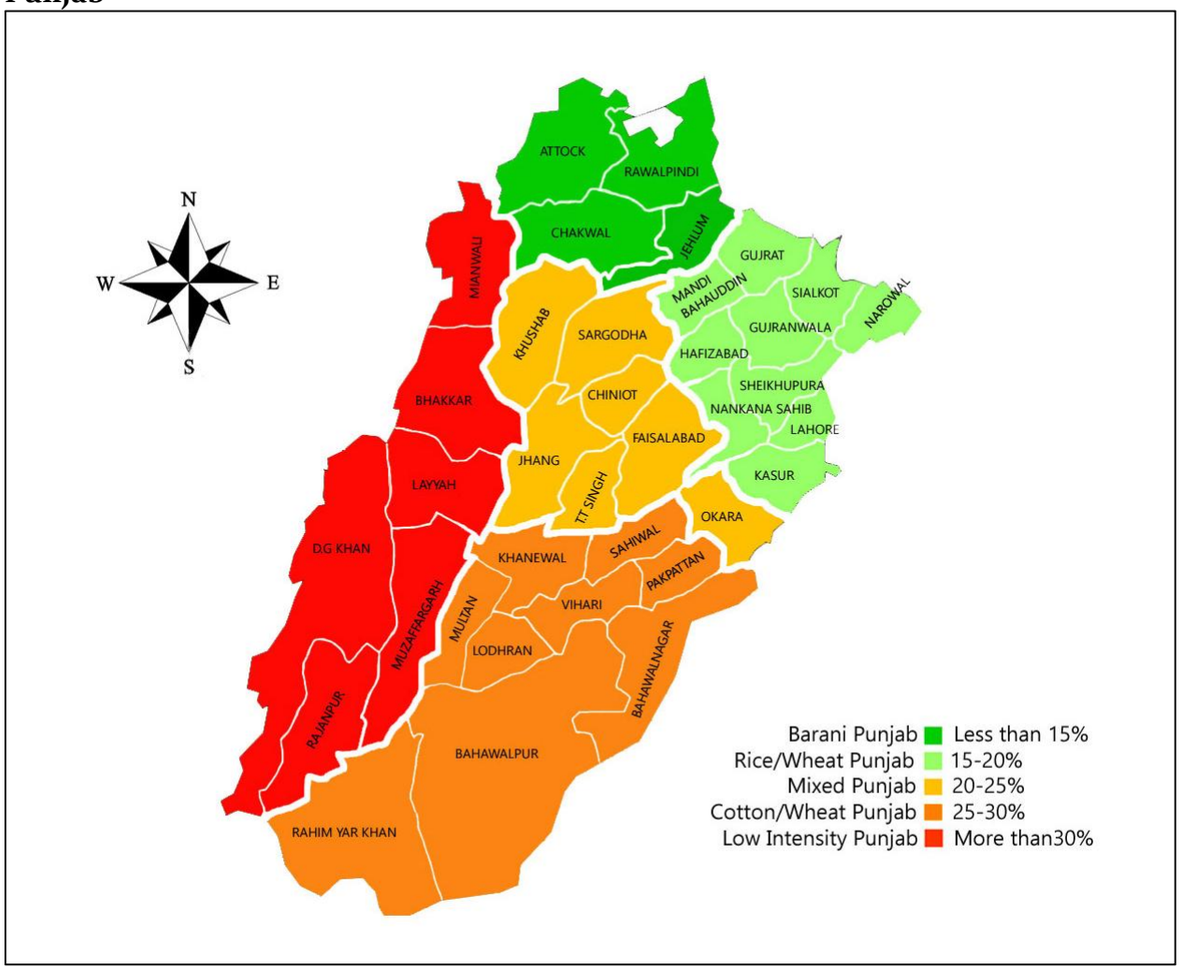
Figure 4.2 illustrates the geographical distribution of the Multidimensional Poverty Index (MPI). The study confirms earlier research, indicating that Northern Punjab is the least deprived area, with an Mo (Multidimensional Poverty Index) value of 0.141. In contrast, Southern Punjab is identified as the most deprived region, with an Mo value of 0.295. These results are consistent with the findings of Gazder et al. (1995), Jamal et al. (2003), Cheema (2008), and Awan (2011).

Figure 2: Multidimensional Poverty Index (Mo) across agro-climatic zones in Punjab



Source: Author's own calculations

When analyzing Mo across different dimensions, a clearer understanding of poverty's composition in various agro-climatic zones comes to light. A significant issue across all zones is cooking fuel, with around 20-24 percent of deprivations among the poor linked to the unavailability of gas, kerosene oil, or electricity for cooking. As a result, many are forced to rely on wood, dung cakes, or crop residues for their cooking needs. Beyond cooking fuel, health and education emerge as key factors contributing to poverty in Barani Punjab. In Mixed Punjab and Rice/Wheat Punjab, congestion also significantly impacts poverty levels, adding another 13-14 percent to the overall multidimensional poverty in these areas. In contrast, in Cotton/Wheat Punjab and Low Intensity Punjab, sanitation issues are a major

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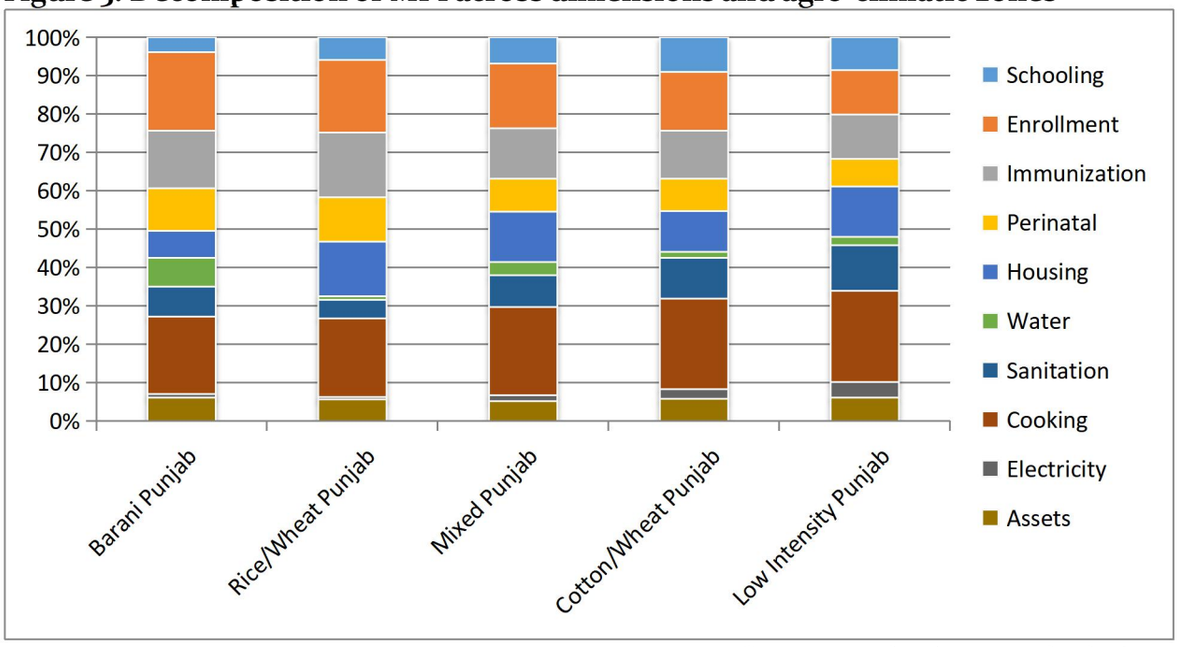
concern, with 11-12 percent of deprivations stemming from the lack of access to improved toilet facilities in these regions.3

Figure 3: Decomposition of MPI across dimensions and agro-climatic zones



Source: Author's own calculations

Conclusion

This study highlights the importance of geographical differences in poverty levels across various regions, providing valuable insights into the factors that contribute to poverty in different areas. By examining poverty from a multidimensional perspective, the study paints a clearer picture of the various deprivations that households face, which can assist policymakers in crafting more targeted strategies for poverty reduction, especially in regions with higher poverty rates. The regional estimates of multidimensional poverty challenge earlier conclusions drawn from unidimensional poverty measures, showing that Low Intensity Punjab is the most deprived zone, with 59 percent of households experiencing multidimensional poverty, closely followed by Cotton/Wheat Punjab at 53 percent.

Decomposing the MPI by its components reveals that elements such as cooking fuel, education, health, housing, and sanitation play crucial roles in overall poverty across all zones. However, the impact of each factor varies by region. For example, education is a particularly significant factor in Punjab, contributing to 23 percent of multidimensional poverty in the province, highlighting the urgent need for educational reforms and investment. Furthermore, housing conditions also require attention, as 12 percent of overall poverty is linked to inadequate housing, with 34 percent of households in Punjab reporting overcrowding, where three or more individuals share a single bedroom.

Ranking agro-climatic zones by multidimensional poverty provides a new viewpoint compared to the usual unidimensional poverty rankings. This change is vital for how resources are allocated, as it ensures that more assistance reaches areas like Low Intensity Punjab, which experiences the highest levels of deprivation. Policymakers should focus on

[3] See figure 4-9 in Appendix-B

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initiatives like conditional cash transfers to boost educational enrollment and enhance educational outcomes. Additionally, implementing housing schemes for low-income communities would help tackle the significant housing shortages in the province. The evidence of concentrated rural poverty further highlights the necessity for region-specific policies, such as targeted rural development strategies, aimed at improving structural conditions and creating opportunities for upward mobility.

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Appendix-A: Agro-Climatic Zones, Indicators and their Cut-Offs

TABLE 1: Agro-Climatic Zones Of Punjab, Pakistan

Sr. No.	Agro-Climatic Zone	Districts
1	Rice/wheat Punjab	Sialkot, Gujrat, Gujranwala, Sheikhupura, Lahore and Kasur
2	Mixed Punjab	Sargodha, Khushab, Jhang, Faisalabad, Okara and Toba Tek Singh
3	Cotton/wheat Punjab	Sahiwal, Bahawalpur, Bahawalnagar, Rahim Yar Khan, Multan,. Vehari and Khanewal
4	Low intensity Punjab	Dera Ghazi Khan, Rajanpur, Muzaffargarh, Leiah, Mianwali, Bhakkar and Dera Ismail Khan
5	Barani Punjab	Attock, Jhelum, Chakwal and Rawalpindi

Source: Pickney, 1989

Table 2: List of Indicators and their Cutoffs

Sr. No.	Indicators	Cut-Off	Dimensions
1	Enrollment	Deprived if no child in household attending school	Education
2	Schooling	Deprived if none of the household members have completed at least 5 years of education	
3	Immunization	Deprived if no child is immunized for measles	Health
4	Prenatal Care	Deprived if mother in the family never got prenatal care	
5	Housing	Deprived if three or more household members share the sleeping room	Living Standards
6	Water	Deprived if the household does not have access to drinking water at home or water source is more than 30 minutes (a roundtrip) away from home	
7	Sanitation	Deprived if household does not have an improved toilet	
8	Cooking	Deprived if main fuel for cooking is not gas/kerosene oil/electricity	
9	Electricity	Deprived if household is not electrified	
10	Assets	Deprived if household does not own any of the listed items*	

* Television, Refrigerator, Washing Machine, Air Conditioner, Vacuum Cleaner, Motorbike, Car or Tractor, and Personal Computer

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Appendix-B: Equal Weights Model

Table 3: Weights

Dimensions	Weights	Indicators	Weights
Education	0.333	Enrollment	0.167
		Schooling	0.167
Health	0.333	Immunization	0.167
		Prenatal Care	0.167
Living Standards	0.33	Housing	0.056
		Water	0.056
		Sanitation	0.056
		Cooking	0.056
		Electricity	0.056
		Assets	0.056

Table 4: Multidimensional poverty headcount across agro-climatic regions

Indicators	Punjab	Punjab Urban	Punjab Rural	Rice/ Wheat Punjab	Mixed Punjab	Cotton/ Wheat Punjab	Low Intensity Punjab	Barani Punjab
Electricity	0.057	0.102	0.274	0.133	0.191	0.288	0.322	0.088
Water	0.068	0.448	0.466	0.434	0.471	0.486	0.437	0.463
Assets	0.158	0.367	0.401	0.390	0.369	0.396	0.439	0.340
Schooling	0.204	0.270	0.254	0.266	0.242	0.271	0.269	0.251
Sanitation	0.244	0.188	0.446	0.325	0.366	0.336	0.498	0.159
Perinatal	0.261	0.081	0.059	0.021	0.097	0.049	0.084	0.170
Housing	0.342	0.031	0.389	0.110	0.233	0.340	0.450	0.179
Immunization	0.388	0.243	0.892	0.470	0.641	0.748	0.896	0.455
Enrollment	0.459	0.016	0.084	0.016	0.044	0.082	0.157	0.021
Cooking	0.630	0.098	0.199	0.127	0.144	0.182	0.227	0.138
Observations	31813	12849	18964	9500	7281	8128	3805	3099

Source: Author's own calculations

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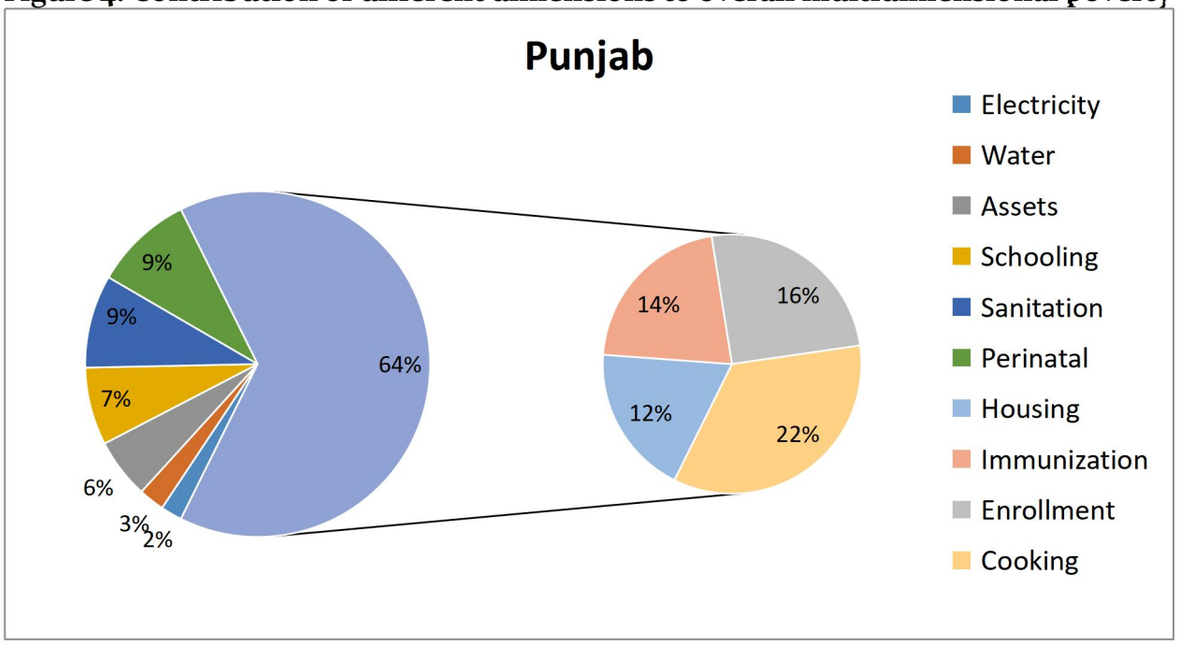
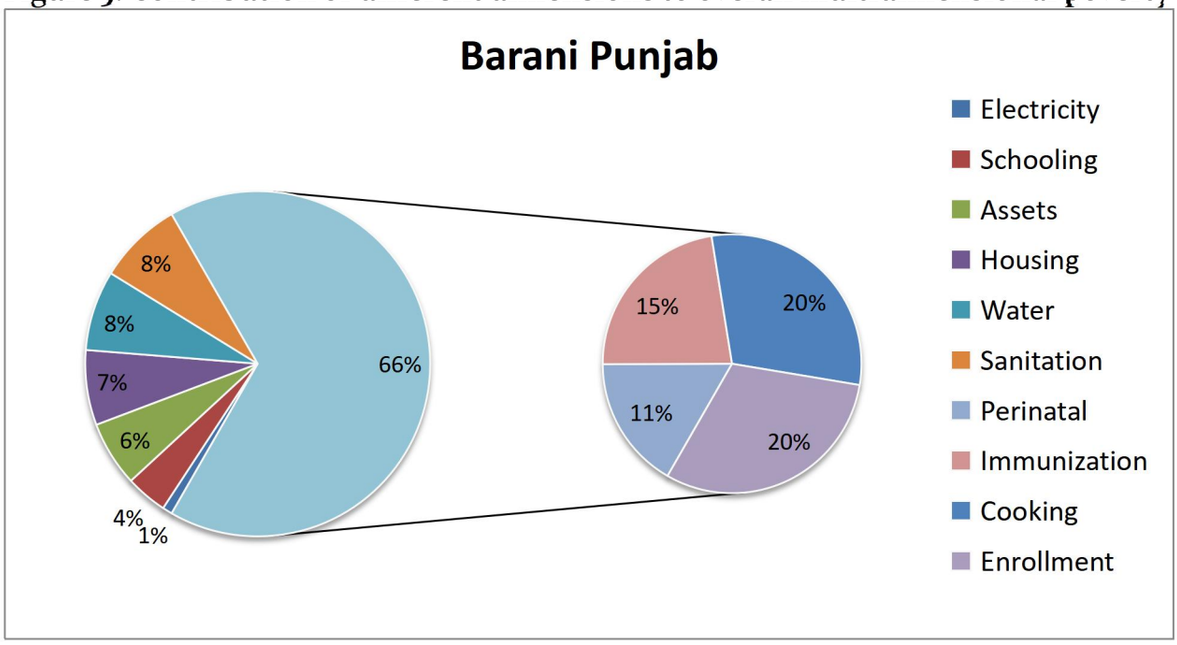
Figure 4: Contribution of different dimensions to overall multidimensional poverty



Source: Author's own calculations

Figure 5: Contribution of different dimensions to overall multidimensional poverty



Source: Author's own calculations

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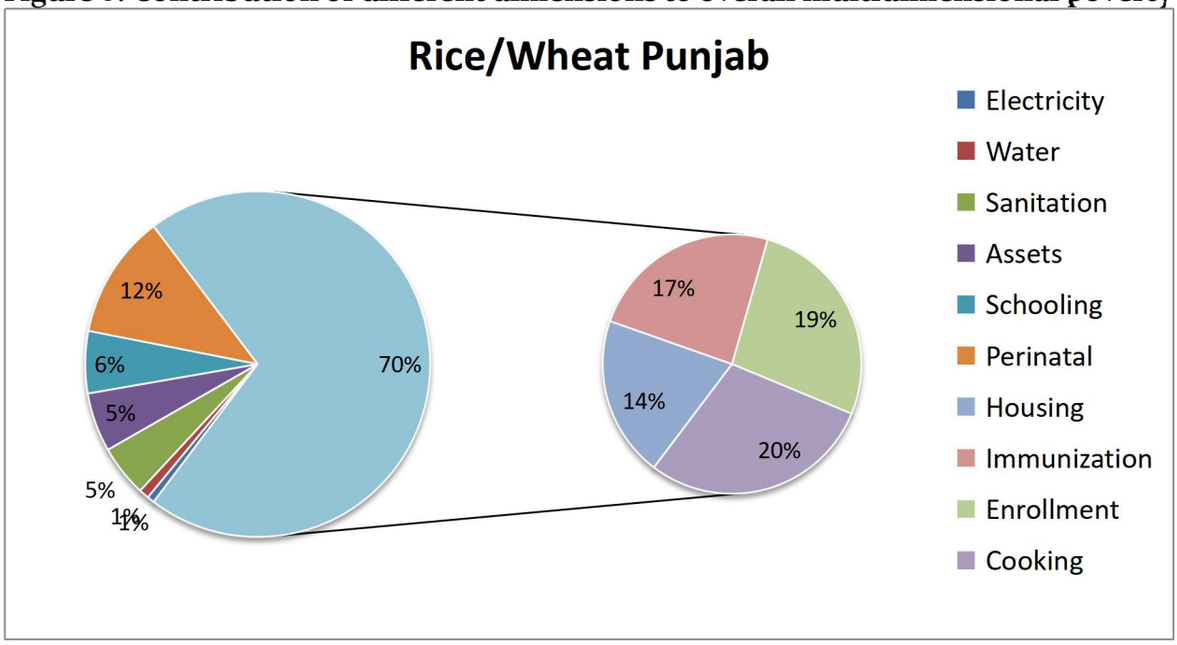
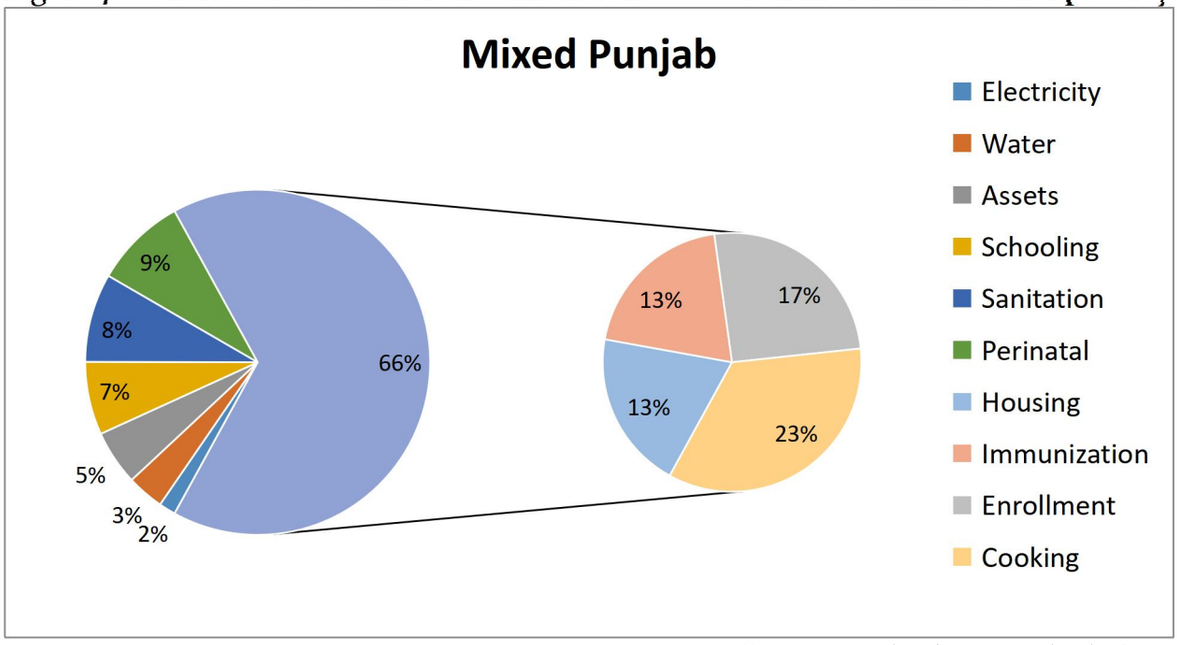
Figure 6: Contribution of different dimensions to overall multidimensional poverty



Source: Author's own calculations

Figure 7: Contribution of different dimensions to overall multidimensional poverty



Source: Author's own calculations

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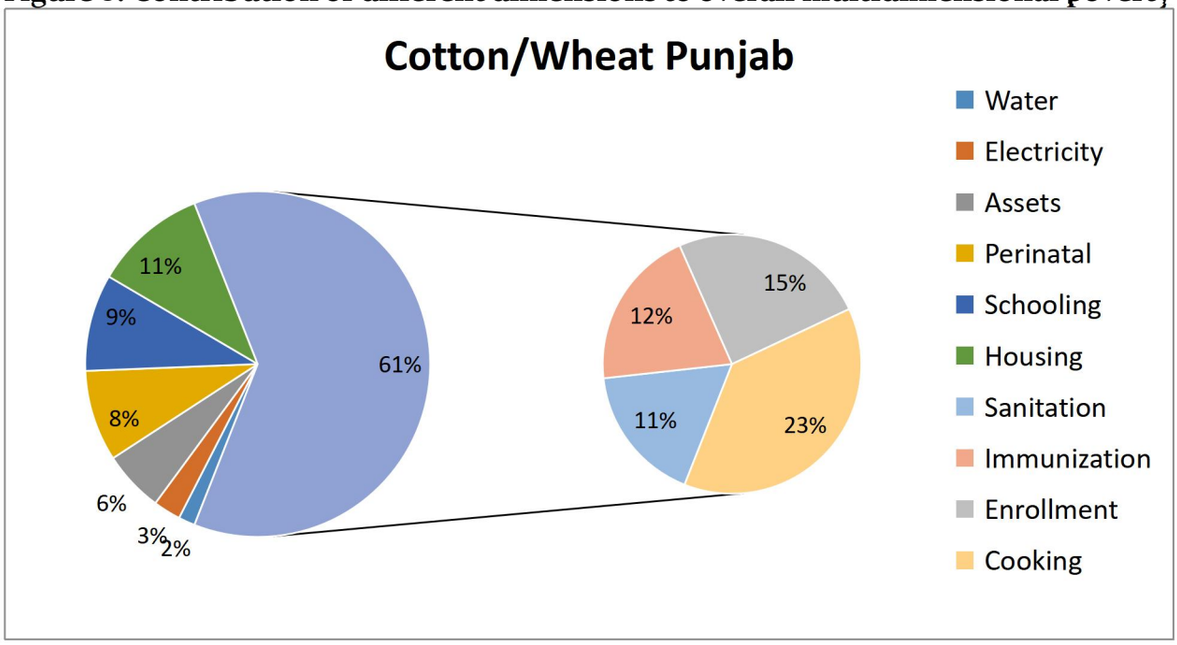
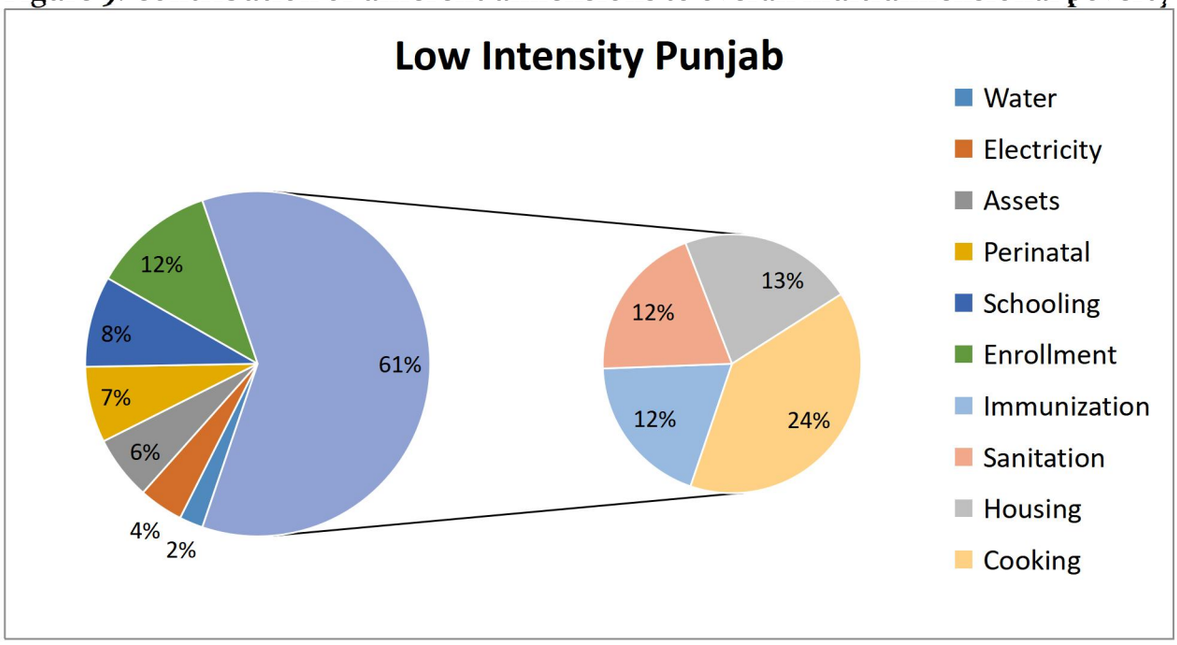
Figure 8: Contribution of different dimensions to overall multidimensional poverty



Source: Author's own calculations

Figure 9: Contribution of different dimensions to overall multidimensional poverty



Source: Author's own calculations

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Appendix-C: Different Weights Model 1

Table 5: Weights

Dimensions	Weights	Indicators	Weights
Education	0.50	Enrollment	0.250
		Schooling	0.250
Health	0.25	Immunization	0.125
		Prenatal Care	0.125
Living Standards	0.25	Housing	0.041
		Water	0.041
		Sanitation	0.041
		Cooking	0.041
		Electricity	0.041
		Assets	0.041

Table 6: Multidimensional poverty headcount across agro-climatic regions

Indicators	Punjab	Punjab Urban	Punjab Rural	Rice/ Wheat Punjab	Mixed Punjab	Cotton/ Wheat Punjab	Low Intensity Punjab	Barani Punjab
Electricity	0.195	0.091	0.265	0.124	0.181	0.276	0.316	0.084
Water	0.326	0.231	0.391	0.271	0.337	0.383	0.369	0.268
Assets	0.229	0.177	0.264	0.207	0.219	0.254	0.294	0.177
Schooling	0.178	0.152	0.195	0.168	0.170	0.191	0.211	0.151
Sanitation	0.215	0.086	0.303	0.171	0.224	0.239	0.362	0.088
Perinatal	0.035	0.026	0.041	0.007	0.035	0.028	0.067	0.095
Housing	0.180	0.020	0.287	0.072	0.170	0.266	0.345	0.103
Immunization	0.342	0.109	0.500	0.227	0.344	0.440	0.525	0.211
Enrollment	0.044	0.009	0.068	0.009	0.032	0.069	0.129	0.013
Cooking	0.109	0.053	0.147	0.074	0.102	0.138	0.174	0.076
Observations	31813	12849	18964	9500	7281	8128	3805	3099

Source: Author's own calculations

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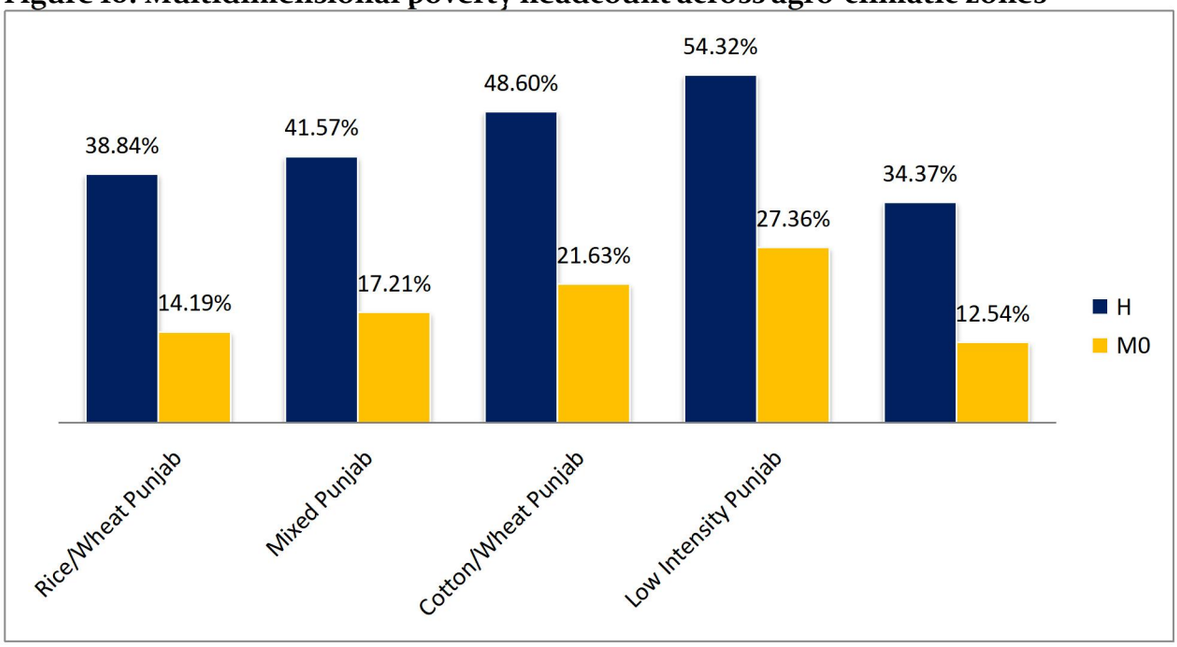
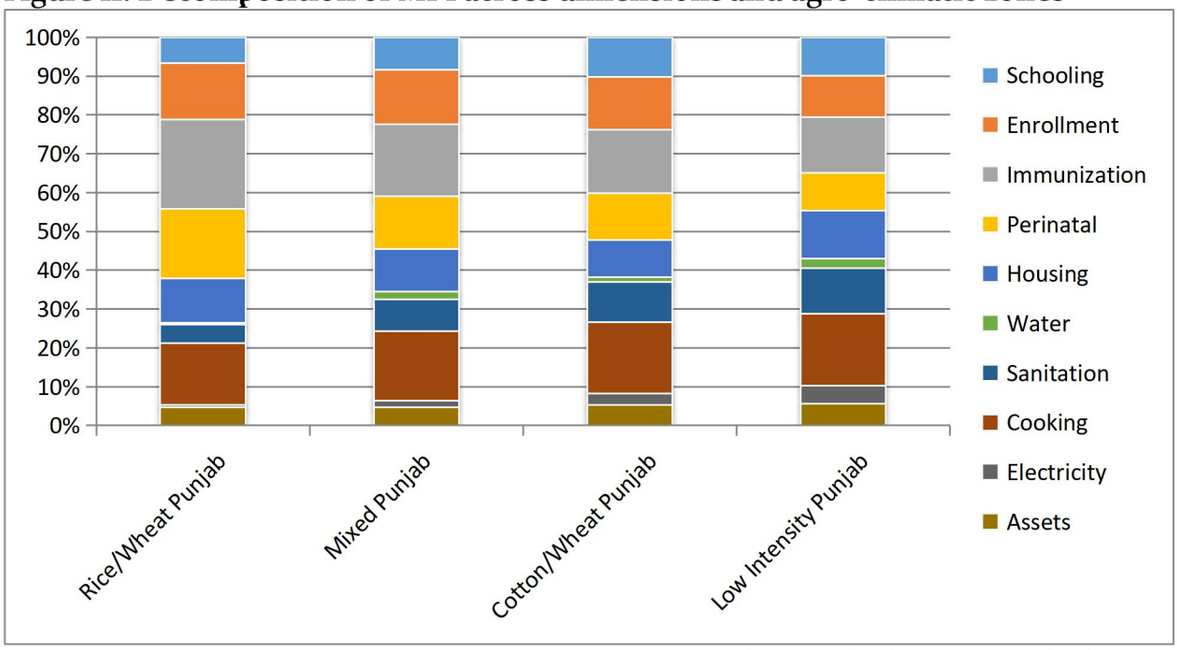
Figure 10: Multidimensional poverty headcount across agro-climatic zones



Source: Author's own calculations

Figure 11: Decomposition of MPI across dimensions and agro-climatic zones



Source: Author's own calculations

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Appendix D: Different Weights Model 2

Table 7: Weights

Dimensions	Weights	Indicators	Weights
Education	0.25	Enrollment	0.125
		Schooling	0.125
Health	0.50	Immunization	0.250
		Prenatal Care	0.250
Living Standards	0.25	Housing	0.041
		Water	0.041
		Sanitation	0.041
		Cooking	0.041
		Electricity	0.041
		Assets	0.041

Table 8: Multidimensional poverty headcount across agro-climatic regions

Indicators	Punjab	Punjab Urban	Punjab Rural	Rice/ Wheat Punjab	Mixed Punjab	Cotton/ Wheat Punjab	Low Intensity Punjab	Barani Punjab
Electricity	0.156	0.063	0.219	0.094	0.144	0.222	0.273	0.062
Water	0.244	0.183	0.286	0.207	0.243	0.293	0.289	0.179
Assets	0.336	0.292	0.365	0.326	0.318	0.354	0.394	0.289
Schooling	0.252	0.257	0.248	0.255	0.234	0.263	0.266	0.238
Sanitation	0.191	0.080	0.266	0.162	0.188	0.205	0.337	0.070
Perinatal	0.033	0.028	0.036	0.008	0.034	0.027	0.068	0.076
Housing	0.156	0.019	0.250	0.066	0.142	0.225	0.320	0.085
Immunization	0.318	0.106	0.462	0.225	0.308	0.399	0.510	0.182
Enrollment	0.040	0.008	0.062	0.009	0.027	0.060	0.126	0.011
Cooking	0.093	0.045	0.125	0.068	0.082	0.117	0.153	0.061
Observations	31813	12849	18964	9500	7281	8128	3805	3099

Source: Author's own calculations

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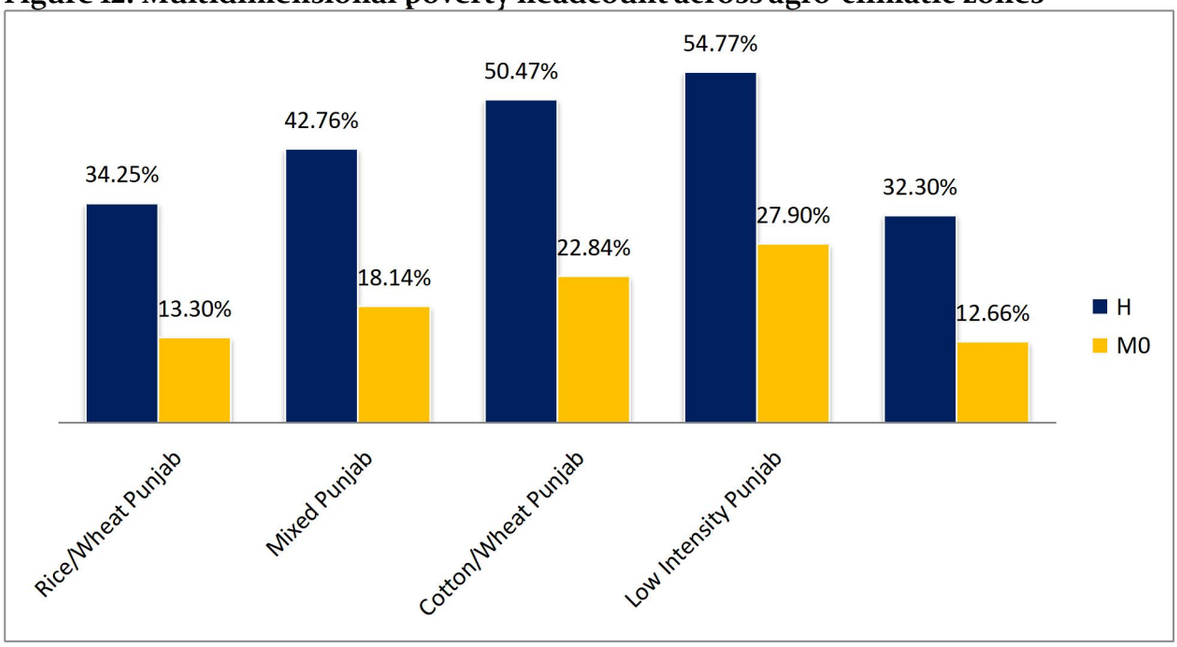
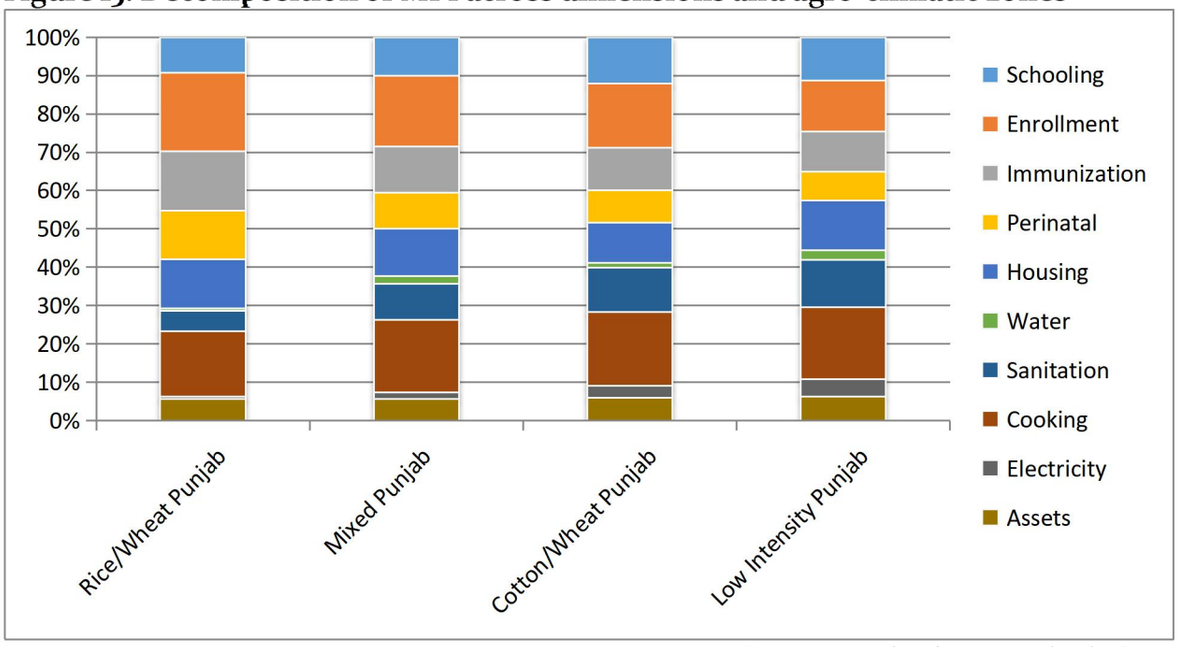
Figure 12: Multidimensional poverty headcount across agro-climatic zones



Source: Author's own calculations

Figure 13: Decomposition of MPI across dimensions and agro-climatic zones



Source: Author's own calculations