International Journal on Advanced Science Engineering Information Technology

Vol.13 (2023) No. 4
ISSN: 2088-5334

Multidimensional Poverty Across Agroecology in Occidental Mindoro, Philippines

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***Abstract*— Poverty in the context of rural farming is site-specific. The differences in natural resource endowment and availability of social services across Agroecology shape farming households' well-being. In the Philippines, there is a scant supply of comparative studies on the multidimensional poverty situation across different farming systems. This study aimed to close this knowledge gap by assessing the multidimensional poverty and its determinants across upland, lowland, and coastal farming areas in Occidental Mindoro, Philippines. Using the Alkire-Foster methodology, data from 210 randomly selected farming households revealed that five of seven households are multidimensionally poor. The coastal area registered the highest Multidimensional Poverty Index at 0.41, where most households are deprived of education, decent housing, clean fuel source, paved access road, and farmland. Also, the analysis exposed the poverty dominance of indigenous farming households over non-indigenous migrant households. For all the Agroecology, the households' lack of education and incapacity to take on economic opportunities and secure productive assets limits them from investing in things that improve their living conditions. Estimates of binary logistic regression showed that non-indigenous farming households with female and educated householders, fewer dependents, larger agricultural holdings, access to formal credits, and non-farm business are significantly less likely to fall into poverty. The local government and concerned development organizations may consider investing in social protection programs that improve access to formal education, spur on-farm and non-farm livelihood opportunities, and enhance public infrastructure services to reduce multidimensional poverty in Occidental Mindoro.**

***Keywords*—Agroecology; Alkire-Foster methodology; indigenous people; multidimensional poverty; farming households.**

Manuscript received 10 Mar. 2023; revised 10 Jun. 2023; accepted 2 Jul. 2023. Date of publication 31 Aug. 2023.

I. INTRODUCTION

Poverty has been a perennial concern globally [1]. It has been practicing worldwide to measure the progress of reducing poverty through monetary metrics. Recently, developing economies are complementing their monetary poverty measurement with several non-monetary indicators due to the increasing recognition that poverty is multifaceted and income alone cannot provide a comprehensive picture of this social phenomenon [2]. In pursuit of "ending poverty in all its forms everywhere," a team of poverty scholars at Oxford Poverty and Human Development Initiative (OPHI), together with the UN Development Program's Human Development Report Office, developed and popularized an acute multidimensional poverty measurement called Multidimensional Poverty Index (MPI). As a global measure, MPI allows international comparisons and in-country assessment on a demographic, sectoral, or geographic basis. Recognizing its importance, governments from many countries are now adopting MPI and using its results in policy formulation. The Philippines has just recently incorporated the MPI in its poverty measurement. In 2018, the Philippine Statistics Authority released its first MPI report measuring poverty across four broad dimensions: education, health, and nutrition; housing, water, and sanitation; and employment [3]. While adopting MPI is a welcome development in the country, its implementation remains challenging, particularly in expanding household-level data and covering basic sectors.

Farmers, fisherfolks, and individuals in rural areas were consistently ranked as the poorest income among the social sectors in the country [4]. The application of MPI in rural agriculture is equally relevant, considering that the deprivations experienced by farmers are multifaceted. Earlier studies on multidimensional poverty in rural farming were done on different geographic and sociodemographic scopes with varying levels of data aggregation. Most of the MPI assessments are drawn to measure multidimensional poverty

across political and administrative boundaries, such as in rural regions and districts in the entire China [5], Vietnam [6], Southern Ethiopia [7], Iran [8], and Pakistan [9]. Some of these studies modified the standard set of global MPI dimensions by adding or removing some indicators to capture the specific context of their research locale.

Available MPI assessments also focused on households or individual farmers producing specific agricultural commodities such as rice [10] and cassava [11]. The respondents were sampled on a regional or national level, and multidimensional poverty levels were assessed across different Agroecology.

The decomposability feature of MPI gained traction in assessing the disparities in multidimensional poverty across different Agroecology. Recent studies in Ethiopia [12] and Punjab province in Pakistan [13] highlighted these differences. Few studies also assessed the multidimensional poverty in mountainous regions, such as those in China [14], [15], [16], and Vietnam [17]. The application of MPI in Philippine rural farming is still limited in number, especially in comparing the multidimensional poverty across Agroecology. These differences determine the household's access to physical and intangible resources and thus may lead to inequalities and deprivations. [13] pointed out that the socioeconomic condition of farmers varies depending on the availability of natural resources in their location. This paper seeks to provide more evidence on varying poverty situations in different farming locations by focusing on the province of Occidental Mindoro, Philippines.

II. Materials and Method

A. Study Area

This study was conducted in Occidental Mindoro, Philippines, one of the provinces in MIMAROPA (Mindoro, Marinduque, Romblon, and Palawan) Region that occupies the western half of Mindoro Island.

B. Data Collection

This study collected primary, cross-sectional data from 210 indigenous (IP) and non-indigenous (non-IP) migrant farming households which were computed using the Cochran formula. The respondent households were selected using multistage purposive random sampling. The first stage purposely sub-grouped the research site according to significant agroecological zones. By referring to the National Color-Coded Agricultural Guide Map developed and managed by the Philippines Department of Agriculture, three major Agroecological zones in Occidental Mindoro were identified: highland, lowland, and coastal. The second stage was the selection of three municipalities that would best represent these zones by visually identifying the most dominant agroecological zone in the chosen area. The third stage was the selection of three barangays (the smallest political unit in the Philippines) within the selected municipalities that also represented their designated agroecological zones. The main criterion for choosing these barangays was the presence of IP and non-IP, migrant households engaged in crop, aquaculture production, animal husbandry, plantation or forestry, and hunting. The fourth and last sampling stage was randomly selecting the farming households from the identified zones. The list of farming households was secured from the Municipal Agriculture Office and used as a sample framework in choosing the respondents from each barangay.

C. Data Analysis

The data gathered was processed using multiple data analytical tools. The farming households were profiled using descriptive statistics, multidimensional poverty was measured using the Alkire-Foster (AF) counting methodology, and determinants of poverty were estimated using the Binary Logistic Regression Analysis.

The AF methodology begins with setting the dimensions, indicators, and their corresponding deprivation cut-offs. This MPI measurement comprises five (5) dimensions of well-being with 17 relevant indicators, which was partially adopted from the study of [18]. The nested equal weights approach was employed in setting weights for each dimension and indicator. The same weights (0.20) were assigned to each dimension, and each weight was equally divided among its corresponding indicators (see Table 1). The deprivation score for each respondent was calculated using equation (1) below:

$$C_i = \sum_{i=1}^{n} (WI)_i \quad (1)$$

where C_i is the respondent's deprivation score, I_i is the respondent's dimension of well-being; and W_i is the weight assigned to the ith dimension.

After computing each respondent's deprivation score, a second cut-off was applied to categorize them according to the intensity of multidimensional poverty they are experiencing. Three (3) poverty cut-offs were set, similar to OPHI's global MPI measurement: vulnerability (20%), acute poverty (33.33%), and severe poverty (>50%). Households that garnered deprivation scores lower than 20% were labeled as non-poor. The headcount ratio or the poverty incidence was calculated by counting the number of multi-dimensionally poor respondents (q) and dividing it by the total number of respondents (n). Equation (2) is shown below:

$$\boldsymbol{H} = \frac{q}{n} \quad (2)$$

TABLE I
MPI METRICS

Dimension	Indicator	The household is deprived	Weight
Education (0.20)	Years of education of family members	If the average educational years of family members who are beyond seven (7) years old is less than ten years.[b]	0.20
Health (0.20)	Household members' health	If any household member is suffering a severe illness (chronic disease) and losing the capacity to work.	0.067
	Participation in a health insurance program	If any household member does not participate in any health insurance program.	0.067
	Covid-19 vaccination	If at least one household member has never been completely vaccinated against Covid-19.	0.067

Dimension	Indicator	The household is deprived	Weight
Living conditions (0.20)	Drinking water condition	If the drinking water is from an unsafe and unstable source.[c]	0.029
	Sanitary condition	If the house of the family is close or is adjacent with the livestock or poultry pen.	0.029
	Toilet condition	If the household is using a communal or shared toilet.[d]	0.029
	Housing condition	If the household has inadequate housing materials in any of the three components: floor, roof, or walls.[e]	0.029
	Road condition	If the road in the community is unpaved.	0.029
	Fuel type	If the household is using dirty energy fuel such as firewood, cow dung, agricultural crop residues, and charcoal, among others.	0.029
	Source of light	If the household is using indoor lighting other than from power grid, generator and renewable energy sources.	0.029
Social relations (0.20)	Mobile internet device use	If the household does not own at least one mobile internet device to communicate.[f]	0.067
	Community information accessibility	If the household does not know the village's annual plan or any critical information at the community level.	0.067
	Emergency money accessibility	If the household has no channel, such as village fund, rural financial cooperative bank, relatives, and friends, among others to borrow money in case of emergency.	0.067
Assets (0.20)	Agricultural-use land size	If the average usable agricultural land size of family members is less than the average level of research samples.[g]	0.067
	House size	If the house size of family members is less than the average level of the research area.[h]	0.067
	Automotive vehicle	If the household does not own any modern vehicle such as tractor, motor or car.	0.067

[a] The well-being dimensions, indicators, and deprivation cut-offs are partially adopted from [18].
[b] Basic education in the Philippines consists of elementary and high school, which takes ten years to complete.
[c] Drinking water is safe and stable if it is piped, public tap water sourced from a borehole or pump, protected well, or spring. Also, the water source can be reached within a 30-minute roundtrip walk.
[d] The private toilet has to be a closed, flushed-type, or pit toilet.
[e] An ideal housing structure is where the floor, walls, and roof are made of finished materials. This definition of finished materials shall follow the classification used by [19].
[f] Mobile devices include laptops, tablets, smartphones, or any similar portable devices that can be connected to the internet
[g] Unit of measurement: hectare
[h] Unit of measurement: square meter

The average deprivation, also called poverty intensity, was computed using equation (3) below:

$$A = \frac{\sum_{i=1}^{n} C_i(k)}{q} \quad (3)$$

$C_i(k)$ refers to the number of indicators where the respondents are found to be deprived relative to the poverty threshold k. The MPI was then calculated by getting the product of poverty incidence (H) and intensity (A).

This paper also explored other well-being factors that can significantly influence the poverty status of households by performing binary logistic regression. The entire sample of households that were categorized as (0) non-poor and (1) poor represented the outcome variable. The possible explanatory variables, on the other hand, were selected by referring to the existing literature. Table 2 describes these model variables.

TABLE II
THE BINARY LOGISTIC REGRESSION MODEL VARIABLES

Variables	Description	Expected Signs
Dependent Variable		
Poverty status	non-poor= 0; poverty= 1	
Independent Variables		
Age	in years	+
Gender	male =1, female =0	-
Years of schooling	householder's number of years in formal education	-
Household size	number of members in the household	+
Dependency ratio	the ratio of dependent members to the working members	+
Ethnicity	Indigenous people=1; Nonindigenous member=0	+
Farm size	in hectare	-
Access to credit	Household with credit access=1; without access=0	-
Non-farm business	Household with non-farm business=1; without non-farm business=0	-

III. RESULTS AND DISCUSSION

A. Profile of the Farming Households: A Tale of Two Ethnic Groups

This section compares the 210 IP and non-IP farming households in Occidental Mindoro, according to selected relevant sociodemographic and economic characteristics. The result shows that, on average, indigenous householders are younger than their non-IP counterparts by almost ten years. Half (51%) of the IP householders interviewed are categorized as Millennials, while non-IP householders are generally classified as Generation X to Baby Boomers. Personal observations suggest that marriage among indigenous Mangyan youth happens even before they reach the age of 20. Tribal culture, family influence, and extreme poverty are among the main reasons indigenous youth decide and sometimes are forced to have a family at a young age [20].

Most of the householders of indigenous and non-indigenous farming families are male. Only a few households are headed by a female mostly widowed or separated from their partner. Regarding the householder's educational attainment, this study found that non-IP householders are more formally educated than their IP counterparts. IP households in the province are characterized by a larger family size with a greater share of dependent members. Compared with the non-IP households with a maximum of ten members, the IP households interviewed for this study comprise as many as 12 members.

In this study, the major and secondary sources of households' income were classified into on-farm, off-farm, and non-farm. [21] defines on-farm income as farming and agricultural production earnings. On the other hand, off-farm income is generated from engaging in seasonal and casual labor from other farms within the neighboring villages. Non-farm income encompasses earnings from the business, non-farm employment, and other sources such as pensions and remittances. Other than farming, non-IP households are more engaged in diverse economic activities than IPs. Though both ethnic groups derive their primary income mostly from on-farm activities, non-IP households also earn from non-farm activities such as retailing, Public Utility Vehicle (PUV) driving, and even office-based, white-collar jobs. Meanwhile, additional income sources for most IP households are limited to seasonal farm work in neighboring villages or towns.

IP households are more engaged in diversified farm production than non-IPs. While the latter mostly produce staple crops like rice and corn, other crops the interviewed indigenous Mangyans produce include vegetables, root crops, and legumes. Backyard rearing of livestock and poultry animals such as pigs and native chickens contributes even more to the diversity of their production. For the longest time, Mangyans have been known to be subsistent farmers, and this is still evident from the indigenous households interviewed in the research locale. This study reveals that IP farmers barely generate a surplus from their produce, unlike non-IPs, who are more inclined to sell their harvest in the local market. The IPs in the Philippines, including Mangyans, have learned to simultaneously produce a combination of species and varieties for food, feed, fuel, medicines, building materials, and cash crops, given their scant financial and material resources [22]–[24]. On the other hand, nonindigenous farming households rely mainly on the cash economy to fulfil some of their primary food and non-food needs.

B. Multidimensional Poverty across Agroecology

The multidimensional poverty status of Occidental Mindoro farming households was measured using the Alkire-Foster methodology. The decomposability feature of this tool allowed this paper to provide insights into the varying incidence and intensity of multidimensional poverty across different geographic settings and ethnic groups.

As shown in Table 3, about 72% or five of the seven farming households interviewed for this study are afflicted with multidimensional poverty. Upland is home to 77% of the poor farming households, followed by the coastal area with a poverty incidence of 74% and the lowland area with 66%. Using a higher poverty cut-off (k= 50%) to estimate extreme poverty, this study found the most impoverished households in the coastal area (37%). Upland and lowland areas virtually host the same number of severely impoverished households, with 30% and 29% headcount percentages. Meanwhile, 19% of the interviewed coastal households are on the brink of falling into multidimensional poverty.

Looking at the intensity of poverty among the poor households, the MPI assessment indicates that they are deprived, on average, of 51% of the weighted indicators. Apart from this measure, assessing the differences in poverty intensity across the three Agroecology is also interesting. Figure 1 shows that four percent (4%) of households in coastal areas live in extreme poverty. In the upland area, 57% of the poor farming households are found in the mid-range (50%-79.9%). It is only in the lowland area where most of its poor farming households experience low poverty intensity (33%-49.9%).

TABLE III
MPI OF FARMING HOUSEHOLDS

Poverty Measure	Agroecology			Aggregate
	Coastal	Lowland	Upland	
MPI (H x A)				
Aggregate	0.41	0.32	0.38	0.37
Non-IP	0.27	0.15	0.27	0.23
IP	0.54	0.48	0.49	0.51
Poverty Incidence (H)				
Aggregate	0.74	0.66	0.77	0.72
Non-IP	0.57	0.37	0.63	0.52
IP	0.91	0.94	0.91	0.92
Poverty Intensity (A)				
Aggregate	0.55	0.48	0.49	0.51
Non-IP	0.47	0.40	0.43	0.44
IP	0.59	0.51	0.53	0.55
Vulnerable to Poverty				
Aggregate	0.19	0.13	0.11	0.14
Non-IP	0.16	0.10	0.09	0.11
IP	0.03	0.03	0.03	0.03
Extreme Poverty				
Aggregate	0.37	0.29	0.30	0.32
Non-IP	0.03	0.01	0.03	0.02
IP	0.34	0.27	0.27	0.30

Overall, it was found in this study that those considered multidimensionally poor in Occidental Mindoro experience 37% of all deprivations for all households. The coastal area registered the highest MPI with 0.41 among the three Agroecology. This index constitutes 36% of the total MPI.

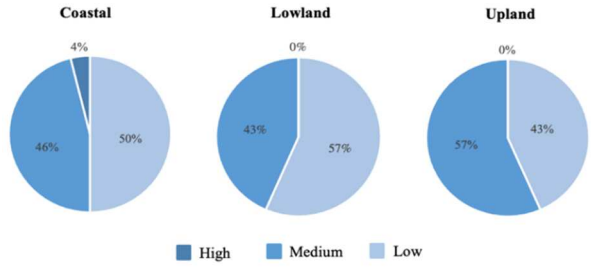

Fig. 1 Intensity of deprivations among multidimensionally poor households

Meanwhile, the upland has a poverty index of 0.38 and the lowland 0.32, contributing 34% and 28% to the total MPI, respectively. Interestingly, this ranking of Agroecology directly corresponds to their income poverty level based on the latest data released by the [25]. While there is no sufficient

evidence of the positive correlation between multidimensional and income poverty in these geographic locations of Occidental Mindoro, the result of this study warrants a closer assessment of the factors that contribute to their varying poverty magnitude, especially in the case of the coastal area.

When examining the MPI difference for two (2) ethnic groups, Table 3 reveals a wide poverty gap between the IP and non-IP households. The former consistently posted the highest poverty incidence and intensity. Ninety-two percent of the interviewed IP households are multi-dimensionally poor, experiencing, on average, 55% of the weighted indicators. Generalized MPIs for IP households across the three Agroecology are two times higher than the non-IPs. These findings support the earlier report by [33], classifying the IPs as among the disadvantaged social group in the country.

C. Incidence of Deprivation among Farming Household

In the subsequent analysis, the raw deprivation headcount per indicator is compared among the three Agroecology. It can be recalled that a household is considered poor if it is deprived in at least 33.3% of the total indicators. Figure 2 shows that households in coastal areas experience deprivation in most of the indicators. Of the 17 indicators, generalized deprivations across the three Agroecology are observed in indicators related to education, living conditions, and assets.

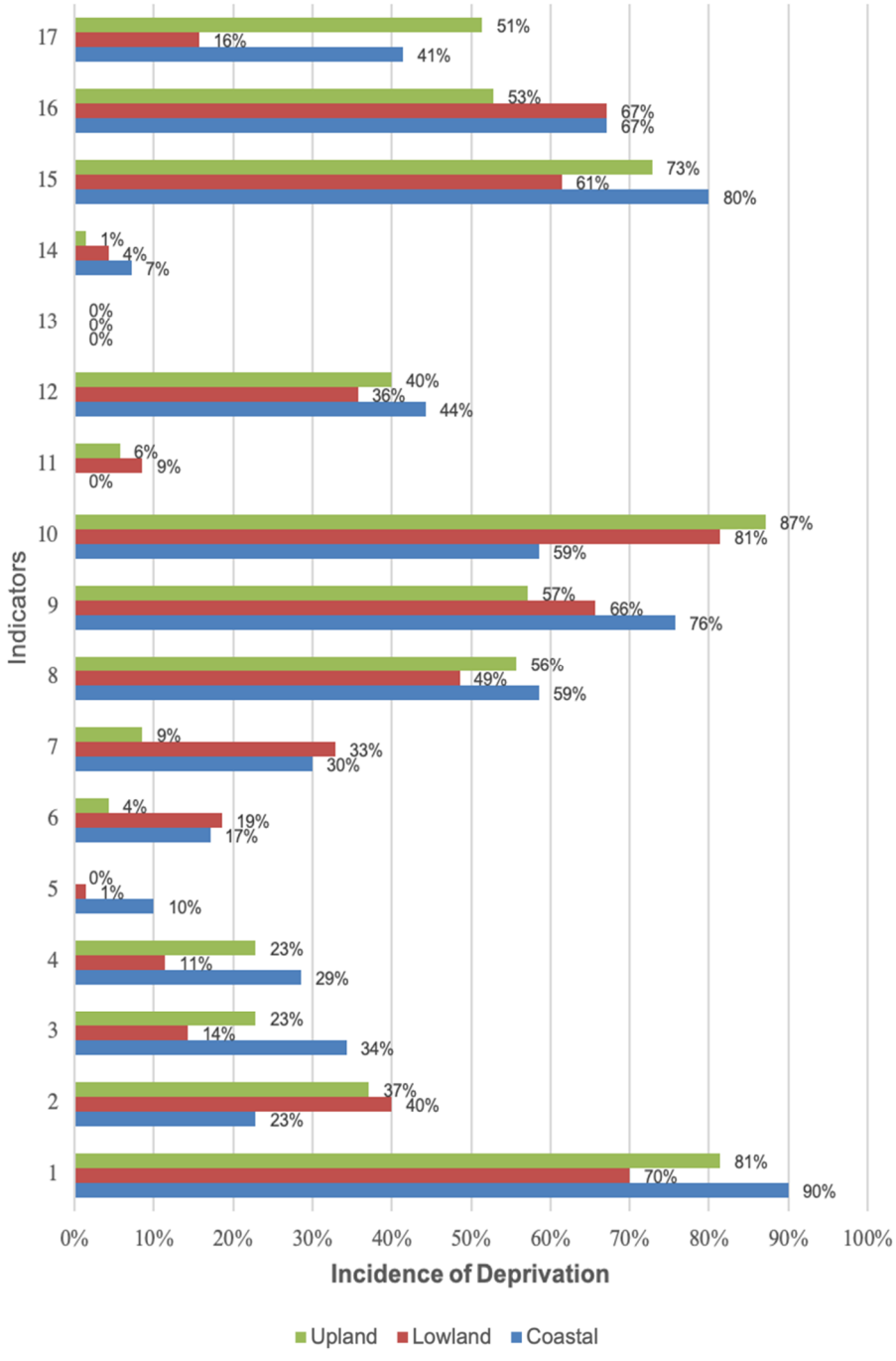

Fig. 2 Raw deprivations across Agroecology by indicators

Legend:

No.	Indicators
1	Years of education
2	Household's member health
3	Participation in health insurance program
4	Covid-19 vaccination
5	Drinking water condition
6	Sanitary condition
7	Toilet condition
8	Housing condition
9	Road condition
10	Fuel type
11	Source of light
12	Mobile internet device use
13	Community information accessibility
14	Emergency money accessibility
15	Agricultural-use land size
16	House size
17	Modern transportation tool

1) Education: Eighty percent (80%) or four of five farming households spent an average of seven years of formal schooling. The coastal area is home to the most undereducated households. Compared with the other areas, the interview with coastal residents revealed that it takes an average of 19.37 minutes to reach the nearest school on foot. In terms of the accessibility of primary education among school children, nearly half of the households (46%) have reported the capacity to finance the education of their children, either through family savings or support from the local government. Moreover, half of the households said they had adequate educational supplies. Educational aid from the government, through its Pantawid Pamilyang Pilipino Program or locally known as 4Ps, receives a positive response from the households in terms of supporting their children's school needs.

2) Health: This dimension assesses the health and healthcare status of farming households in Occidental Mindoro. Thirty-three percent (33%) of the households are afflicted with chronic diseases ranging from hypertension, arthritis, and diabetes to other respiratory complications like asthma and tuberculosis. More than half of the interviewed households said they could barely afford to seek professional disease treatment. Furthermore, on average, it takes an hour to reach the nearest hospitals that can diagnose and treat these kinds of illnesses. In the past 12 months, 79% of the interviewed households reported that they experienced minor illnesses like fever, flu, and cold only once or twice. In these instances, they prepare natural concoctions from available medicinal plants as their remedy. Though health centers are commonly situated in the area and can be reached in 24 minutes by walk, most respondents lamented that most of these community health facilities lack adequate medical supplies and are not available for consultation. [26] found that rural poverty, indigenous ancestry, and issues with healthcare access are significantly associated with low COVID-19 vaccination rates. In Occidental Mindoro, 21% of the households interviewed lack at least one COVID-19 vaccinated member. Respondents shared those vaccines are always made available to them. However, most unvaccinated individuals are still apprehensive about getting the shot, fearing its alleged side effects. Vaccine hesitancy among economically disadvantaged groups is stemmed partly from disparate views about the vaccine and perceptions of public information, among others [27]. Among the three Agroecology, concerns about the low rate of health insurance participation and COVID-19 vaccine coverage are evident in the coastal area. Meanwhile, the highest incidence of chronic diseases is noted in lowland households. Further assessment of the state of the healthcare system in this area is crucial despite its low incidence of deprivations on health insurance and COVID-19 vaccination.

3) Living Conditions: This dimension measures the living condition of the households by assessing the quality of their drinking water, housing, paved road access, sanitation, energy, and fuel sources. It was found in this study that half to the majority of the households in Occidental Mindoro use dirt fuel for cooking, do not have access to paved community roads, and live in a house with poor construction materials. Seventy-five (75%) of the interviewed households are using firewood and charcoal as their cooking fuel. Compared with liquid fuel, these materials are considered affordable and readily available, especially in areas with rich vegetation [28]. Indigenous Mangyan households live in elevated bamboo huts with roofing made of natural materials like cogon grass and palm leaf. The structure of their house is conspicuously different from their non-IP counterparts, who live in cemented houses with metal roofing. Thus, the overall deprivation reduction in this indicator lies in supporting and capacitating IP households to switch to more decent housing structures. The findings also imply the need for public community-level investment in access roads, as more than half (66%) of the households are still situated in areas with dirt roads.

This study noted a few incidences of deprivation of decent toilets, sanitation, and safe and stable drinking water sources. Seventy percent (70%) of the household respondents already use a private, enclosed pour-flush toilet. Even so, this paper does not discount the fact that some farming households still depend on communal toilets and, worse, practice open defecation. Adding to an improved sanitary condition of the households is the absence of livestock animals that emit foul odors in their respective area or a well-distant pen from the house. Their drinking water comes from springs, boreholes or pumps, pipe water, and water treatment facilities. They spend only an average of 8.05 minutes fetching drinking water.

Across the three Agroecology, coastal households are most confronted with issues on the safety and stability of drinking water, housing structure, and paved access roads. Meanwhile, poor sanitation, toilet condition, and light source are immediate concerns in the lowland areas. Significant deprivation of sustainable fuel sources is noted among households in upland areas.

4) Social Relations: The deprivations on social relation dimensions are assessed based on the ownership of internet devices, access to community information, and availability of emergency money sources. For all the Agroecology, mobile internet devices accounted for the highest deprivation with 40%. The highest raw incidence of deprivation is found among four of five households in the coastal area. Other indicators like emergency money and communication information accessibility registered little to no deprivations.

Access to stable internet connections remains challenging across the three communities. Most respondents lamented poor network services in their respective areas, which compels them to go to distant sites with good reception of signals to send and receive messages or calls. The state of public communication in these areas plays little role in disseminating information concerning their village. Households rely mainly on local officials for updates and information, commonly coursed through the neighborhoods for faster dissemination.

In times of financial difficulties, relatives and acquaintances are the most reliant and immediate source of emergency money for most households. Personal observations suggest that households generally remain apprehensive about securing money from local and informal credit with a worry of getting burdened by interest rates.

5) Assets: Under the asset dimension, deprivations among the households are assessed based on their ownership of farm and non-farm assets such as agricultural land, adequate house size, and modern vehicles. This study noted the highest prevalence of deprivation in agricultural land and house size. The average farmland size of the households across the three Agroecology is 1.21 hectares, which has hardly increased from the average 1.604 hectares of farm holding in the MIMAROPA region. It was found in this study that 71.43% or five out of seven farming households in Occidental Mindoro are tending legally owned farmlands that are less than the average 1.21 hectares. This issue is observed mainly among coastal farming households.

For the non-farm assets, the respondent households live in a house with an average floor size of 29.10 square meters. Sixty-seven percent (67%) or two of three households live below the average floor size in coastal and lowland areas. Meanwhile, deprivation on modern vehicles stands at 36.19%, indicating that one out of three households own no automotive vehicles. Those households not deprived in this indicator mostly owned motorcycles for family use or as a source of income from public transportation service.

D. Share of Each Dimension to the Multidimensional Poverty

From a policy development perspective, it is useful to identify the dimensions or areas of well-being that significantly contribute to the subject sector's multidimensional poverty. The decomposed result of the MPI provides policy recommendations that are critical in addressing the deprivations experienced by people living in poverty.

Figure 3 illustrates that the major contributors to the MPI across the three Agroecology are the dimensions of education, assets, and living conditions. The education dimension, having the highest share of the poverty index, requires due attention in poverty alleviation efforts, especially in the case of poor upland and lowland households. Making formal education more physically and economically accessible in these areas is seen to address the overall poverty in the province significantly. Deprivation of assets is of critical concern, primarily for upland and coastal households. Reduction of multidimensional poverty would also hinge on enriching their farmlands' size and productivity. Lastly, the significant contribution of the living condition dimension to the MPI is mostly noted in the lowland area, which warrants support for improving the lowland households' sanitation, housing, and energy source.

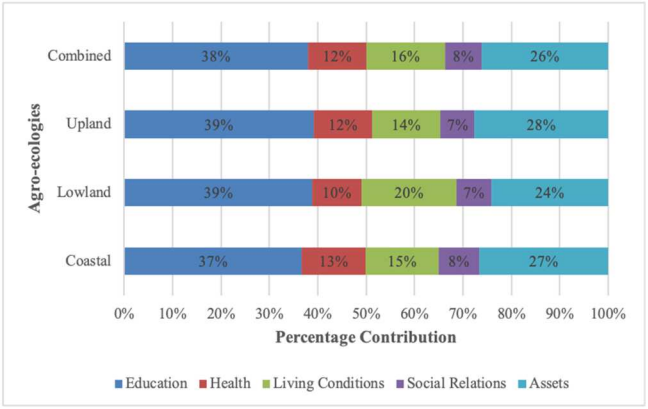

Fig. 3 Share of each dimension to overall poverty

E. Determinants of Multidimensional Poverty

This chapter section assessed the factors influencing the multidimensional poverty in Occidental Mindoro using binary logistic regression. The regression result in Table 4 reveals that the householder's gender significantly influences their household's multidimensional poverty status. Specifically, male householders are seven times more likely to become multidimensionally poor than their female counterparts. In most of the previous studies, the risk of becoming multidimensionally poor is greater for female-headed households than males due to the former's lower educational attainment and lack of opportunity to own productive assets [29], [17]. [30] argue that the predominance of patriarchal households in poverty-stricken rural areas explains this gender disparity in favor of the female-headed ones.

As expected, the likelihood of a household being multidimensionally poor is negatively and significantly related to the higher educational attainment of the householder. The analysis shows that a one-year increase in the head's years in formal education makes the household less likely to fall into poverty by a factor of 0.78. Similarly, the mean predicted probability of a household with 14 years in an academic institution decreases to 43%. Well-educated households are more likely to send their children to schools, prioritize the members' health, invest in essential assets, and take on economic opportunities to cushion poverty risks [31]. This poverty-alleviating impact of education in rural and farming households is consistent with similar studies conducted in Nigeria [11], Indonesia [29], India [32], and Ethiopia [7], [12].

Economically inactive household members put pressure on the family's ability to sustain their collective needs [29]. The result of the regression analysis aligns with the earlier finding of [14] and [7] on the significant direct association between multidimensional poverty and the household's dependency ratio. The odds ratio indicates that an additional dependent member increases the household's likelihood of falling into poverty by a factor of 1.5.

Being part of the indigenous group in Occidental Mindoro is equated to being multidimensionally poor. The regression result showed that IP farming households are 12 times more

likely to become poor than non-indigenous counterparts. Furthermore, the marginal effect shows that the poverty level of IP households would be 36% higher than non-IP households. The IP and Indigenous Cultural Communities in the Philippines are still hounded with multifaceted issues on access to education [33], undernutrition and nutrient deficiency [34], and food insecurity [35], among others. [36] noted a similar case among indigenous communities in Peninsular Malaysia, where IPs lack access to health services, education, social infrastructures, and other basic human needs.

As for the farming-related factor, the regression result corroborates with that of [7], which estimates the positive effect of tilling a considerable agricultural land on a household's economic well-being. The odds ratio indicates that a unit increase in the size of agricultural land decreases their odds of falling into poverty by a factor of 0.61. This incremental increase in farm area suggests more crops to be cultivated for subsistence and commercial purposes [31]. While bigger farmland is a crucial asset in improving the well-being of a household, [37] cautioned that cultivating diversified crops in a larger farm size may suffer inefficiency issues, consequently compromising its poverty reduction effect.

Consistent with the previous studies [21], [29], this paper provides strong evidence of the negative association between poverty and access to formal credit in Occidental Mindoro. Specifically, the regression analysis indicates that the farming households with access to formal credit are less likely to become multidimensionally poor than those without access by a factor of 0.02. However, in this study, only a few primarily non-poor households have knowledge and experience in availing such financial services. Most poor small-scale farmers still source their loans mainly from informal lenders. [38] found that, among others, those farmers who perceive repayment periods as rigid and lending requirements as tedious are less likely to avail of loan products from formal lending institutions. This reluctance is empirically observed in resource-poor farmers with limited income, farm size, and assets considered eligible as loan collaterals [39].

Lastly, this paper found sufficient evidence of the positive effect of non-farm businesses on alleviating poverty among rural farming households. Past studies have shown that a diversified income from non-farm activities improves the household's economic condition [7], [21]. In the context of farming households in Occidental Mindoro, the result implies that aside from farming, earnings from engaging in non-farming activities contribute to family savings.

The analytical model is statistically significant, with a likelihood ratio chi-square of 24.03 and a p-value of 0.0000. The result indicates that the model fits significantly better with sociodemographic and economic predictors. Similarly, the Hosmer-Lemeshow Test has confirmed that the model fits the data well with a p-value of 0.1688. As shown in Table 4, the model is 85.58% accurate in predicting the likelihood of multidimensional poverty in Occidental Mindoro. This figure is higher than the 50% accuracy threshold to be considered an ideal model.

TABLE IV
DETERMINANTS OF MULTIDIMENSIONAL POVERTY IN THE FARMING HOUSEHOLDS

Variables	Odds	Marginal Effects	p-value
Age	1.03		0.127
Education	-0.78		
0 year		0.96	0.000***
7 years		0.81	0.000***
14 years		0.43	0.001***
HH size	-0.78		0.093
Dependency ratio	1.48		0.030**
Gender			
Female (base)		0.48	
Male	7.01	0.86	0.003***
Ethnicity			
Non-IP (base)		0.59	
IP	12.41	0.95	0.000***
Farm size	-0.61		0.009***
Access to formal credit			
Without access		0.87	
With access	-0.02	0.13	0.016**
Engagement in non-farm business			
Without business		0.89	
With business	-0.38	0.75	0.039**
Hosmer-Lemeshow Test (p-value)		0.1688	
Likelihood-ratio Test (p-value)		0.0000	
Predictive accuracy		85.58%	

Note: ***, **, * denote 1%, 5%, and 10% level of statistical significance, respectively

IV. CONCLUSION

The result of the MPI supports the literature that multidimensional poverty is indeed a rural farming phenomenon. The analysis revealed that five of seven farming households in Occidental Mindoro are afflicted with multidimensional poverty. A third of these households, mostly Indigenous families, are experiencing extreme poverty, proving that indigenous communities are among the country's poorest social sectors. In terms of deprivation, farming households in the province generally lack years of formal education, decent living conditions, and basic physical assets. It can be synthesized that their lack of education hinders their capacity to take on economic opportunities and secure productive assets, which limits them from investing in things that improve their living conditions. Among the three Agroecology, the coastal area is home to the multidimensionally poorest households in the province, experiencing the highest intensity of deprivations in education, living conditions, and assets. Specifically, poverty in this area is significantly attributed to households' below-average years in formal education, poor housing structures, use of dirt cooking fuel, presence of dirt community access roads, and below-average farm size.

Farming households with a male householder, a higher number of dependents, and that are indigenous are significantly at risk of becoming multidimensionally poor. Meanwhile, those households with higher householder's educational attainment, larger agricultural holdings, access to

formal credit, and are engaged in non-farm business are significantly less likely to fall into poverty.

The local government and concerned development organizations may consider investing on social protection programs that improve physical and economic accessibility to education, spur on-farm and non-farm livelihood opportunities, as well as enhance public infrastructure services to reduce multidimensional poverty in Occidental Mindoro. This paper found that the parents are among the household members with the lowest educational attainment. The conditional cash transfer program of the government that supports school children in impoverished communities is worthy of continuous implementation to reduce intergenerational poverty in education. Livelihood assistance is also equally important to increase household savings and subsequently support the school children until a higher level of education.

This paper also underscored the importance of income diversification for farming households and the effectiveness of formal credit schemes in increasing family savings and improving their economic condition. The result suggests strengthening the local agricultural and rural credit programs by relaxing the lending requirements and offering reasonable interest rates to encourage more rural households to avail credit services.

Another clear policy implication of this paper is the reduction of the stark economic divide between the indigenous and non-indigenous transmigrant households. Given their subsistence nature of agricultural production, development programs designed for the benefit of indigenous farmers should focus on capacitating them to produce surplus and integrate them to the market. The economic benefits of this program can be maximized by organizing them as associations of producers and empowering them to achieve economies of scale and bargaining power in the market.

This paper has to be seen in light with some scope limitations. Future research may extend the topic by exploring the linkage of multidimensional poverty with income poverty. As revealed, the level of multidimensional poverty in the three Agroecology directly corresponds to the level of income poverty in their political boundaries based on the official statistics. This begs the question whether there is a robust correlation between these two types of poverty across different locations.

ACKNOWLEDGMENT

The corresponding author thanks the Universitas Gadjah Mada for the funding support and the Department of Agriculture RFO IV-MIMAROPA for the logistical assistance during the survey.

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