Livelihood assets and poverty among fishing households in Bicol Region, Philippines during the COVID-19 pandemic

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ABSTRACT

Research efforts concerning COVID-19 primarily focused on the macro-level impacts of the pandemic on multiple fronts. Less attention was paid to individuals and less still to the socio-economic condition of the poorest sectors. This research addresses this gap by utilizing the theory of change (ToC) of asset ownership to examine the effects of livelihood asset ownership on the poverty status of 200 fisherfolk households in the Bicol Region, Philippines, during the pandemic. The study employed descriptive measures and logistic regression with principal component analysis (PCA) to examine the survey data. Results revealed that ownership of productive assets increased the likelihood of households maintaining the status of nonpoor compared to households who owned less to nothing. Whereas, households with more physical assets were more likely to fall below the poverty line during the pandemic. Defining poverty in terms of livelihood asset ownership has important implications for policymakers. Addressing these evidence gaps enables a nuanced analysis of the socio-economic condition of fishing households during the pandemic. The study suggests that aid organizations and funding agencies should complement grants with efforts that promote asset ownership through capacity-building services like training, mentoring, and providing market links for fishing communities.

Keywords: binary logistic regression, fisheries sector, household poverty, principal component analysis

INTRODUCTION

The COVID-19 pandemic has significantly impacted global healthcare systems and socio-economic development. Thus, making it highly difficult for countries to achieve zero poverty set out in the 2030 Sustainable Development Goals. For the first time in over 20 years, the global extreme poverty rate rose, with around 119 to 124 million people pushed back into extreme poverty and chronic hunger (UN 2021). In lower-middle-income countries, the lockdown and physical distancing measures have

significantly impacted around 92% or 379 million of 413 million informal workers employed in agriculture, forestry, and fishing (ILO 2020).

Initially, restrictions on transport, labor mobility, and public place closures acted as supply shocks to the economy, which eventually weakened the demand for goods and services as people were sheltered in their homes (Park et al. 2020). Overall, the containment measures adopted worldwide depressed economic activities. Available data during the first half of 2020 recorded economic contractions in developing Asian economies. Some had even experienced a recession, including the Philippines (Sawada and Sumulong 2021). In August 2020, the Philippine Statistics Authority (PSA 2020a) reported the lowest recorded quarterly growth since 1981. The Philippine gross domestic product (GDP) dropped by 16.5% in the second quarter of 2020, following a 0.7% decline during the first quarter of 2020.

With the pandemic triggering a global recession, millions of people have been exposed to harsh and profound inequalities. Not surprisingly, it has affected the world's poorest and most vulnerable people residing in the rural and coastal areas, especially the fishing communities. For example, the impact of the pandemic during the first quarter of 2020 was estimated to have resulted in a 3.11% reduction in the aggregate volume of agricultural production in Southeast Asia (Gregorioa and Ancog 2020). To support small-scale fisheries, countries in Southeast Asia supplied financial help and food subsidies to address immediate food and non-food needs (Ferrer et al. 2021). Worldwide, governments have put in place around 1,600 short-term social protection measures in response to COVID-19 but still fall short of covering an estimated number of 4 billion people (UN 2021). In the Philippines, emergency support was given to households during the pandemic through the Social Amelioration Program (SAP) (Department of Finance 2020). Although it can be argued that households may also rely on financial assistance from employers, loan grants from banks, social security from the government, and remittances from relatives, these options are not equally available, especially for poorer households (Abrigo et al. 2020).

Fisherfolks, in particular, are notoriously marginalized in national statistics (PSA 2020b). Despite being recognized as the frontline in food security (DA Communication Group 2020), many fishing households live in poverty (Labayo and Preña 2021; Palanca-Tan and Bongat-Bayog 2021) and lack productive assets (WorldFish Center 2007), making them vulnerable to extreme shocks and stressors, including the COVID-19 pandemic, recurrent typhoons, and the recent recession (Preña and Labayo 2022). Needless to say, they lack the capital and resources to cope with these sudden shocks since they are often reliant on fisheries resources for food and income.

According to PSA reports on poverty incidence for the primary sectors in the country, the fisherfolks consistently posted one of the highest poverty incidences among the sectors in 2015 (36.9%) and 2018 (26.2%) (PSA 2020b). Among these poverty estimates, the incidence of poverty during the onset of COVID-19 in the Philippines in 2020 was not recorded. Consequently, there was no data to measure the poverty status of fisherfolks during the pandemic.

As the pandemic unfolds, further evidence of its impacts on socioeconomic development is also expected to grow in the academic literature. However, existing research leaves room for further investigation on at least two aspects. First, the poverty status during the pandemic lacks micro perspectives. The research papers published in academic literature were either limited in content and geographical coverage or mainly focused on macro perspectives. Second, quantitative analyses targeting fishing households within the context of the Bicol Region remain primarily unknown and insufficiently researched. The study directly provided a novel perspective that has not drawn attention in similar socio-economic studies by investigating the effects of asset ownership on poverty conditions that characterized the fisherfolks in the region during the pandemic.

In order to inform COVID-19 recovery and mitigation policy responses concerning poverty in the fisheries sector, it is critical to understand the preconditions necessary to achieve resilience and create opportunities for poor people (Kumaraswamy et al. 2020). To this end, this paper presented evidence on how ownership of livelihood assets impacted the poverty status of fishing households engaged in aquaculture and fish processing during the COVID-19 pandemic in the fishing communities along the Albay, Ragay, and Asid Gulfs in the Bicol Region, Philippines. The Department of Agriculture Bureau of Fisheries and Aquatic Resources (DA-BFAR) identified these fishing households and provided them with livelihood support as part of the Fisheries, Coastal Resources, and Livelihood (FishCORAL) Project. This project, is a joint effort between the Philippine Government and the International Fund for Agricultural Development (IFAD), spanned five years from 2016 to 2020. Specifically, this paper sought to assess the socio-economic conditions of fishing households in terms of household head characteristics, asset ownership, and poverty incidence. Finally, the paper estimated the influence of asset ownership and socio-economic factors on the poverty situation of

fishing households in the Bicol Region using a regression model.

METHODS

Study Area and Sampling Design

The study focused on eleven fisherfolk groups that were given livelihood projects (e.g. aquaculture and fish processing) under BFAR's FishCORAL Project (Table1). These groups are situated across the three provinces in the Bicol Region, namely Camarines Sur, Masbate, and Sorsogon (Figure 1). A multistage sampling technique was employed to 200 samples out of 1152 fishing households considered for the study (MOE = 0.069, z = 1.96). After purposively selecting the province, municipality, and coastal barangays covered, the "RAND" function in MS Excel was then employed to select households administered with the questionnaire.

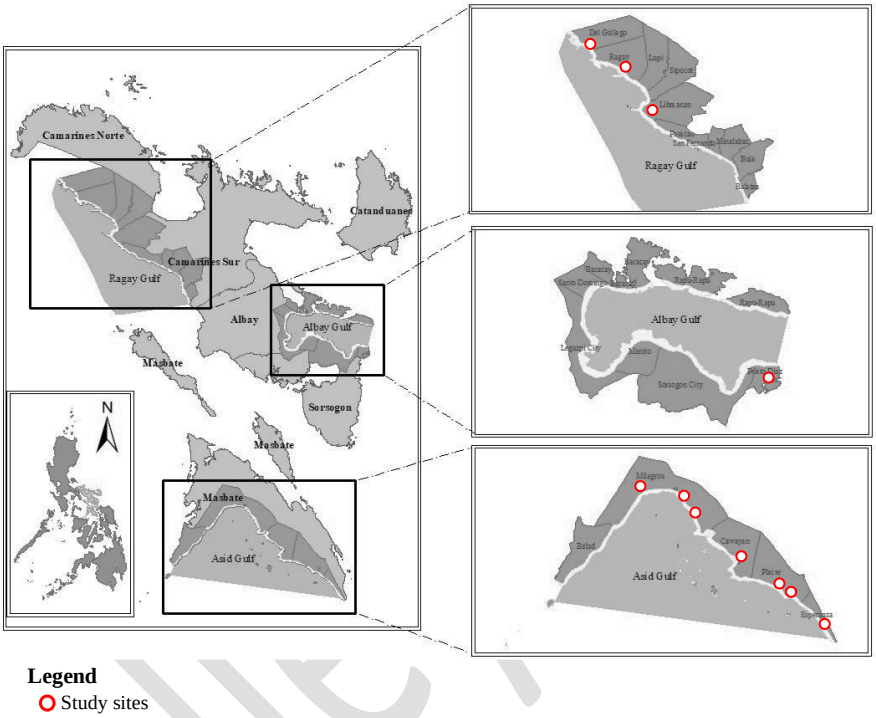

Figure 1. Map of the Bicol Region showing the eleven study sites.

Table 1. Sample respondents by municipality and livelihood in Bicol Region, Philippines.

Province	Municipality	Livelihood	Population (N)	Sample (n)
Sorsogon	Prieto Diaz	Danggit Processing	81	14
Camarines Sur	Libmanan	Bangus Culture	138	24
	Del Gallego	Grouper Culture	109	19
	Ragay	Grouper Culture	92	16
Masbate	Milagros	Aquasilviculture	127	22
	Placer	Aquasilviculture	46	8
	Milagros	Kropek Industry	58	10
	Milagros	Fish Drying	29	5
	Cawayan	Seaweed Culture	219	38
	Esperanza	Seaweed Culture	109	19
	Placer	Seaweed Culture	144	25
Total			**1,152**	**200**

Data Collection

Respondents were provided informed consent before the interview. The interview process also observed the anonymity and confidentiality of the responses given. Furthermore, it was made clear that their participation was voluntary and that they may choose to end the survey at any time, with their information remaining confidential. A field survey was conducted face-to-face with household heads from February 2021 to May 2021. The data used for this study were generated using structured questionnaires divided into two sections: household profile and asset ownership.

Theoretical Framework

This study utilized the theory of change (ToC) for asset ownership developed by the Consultative Group to Assist the Poor (CGAP) and World Bank (Kumaraswamy et al. 2020). The asset ownership was categorized into income-generating assets (productive assets) and quality-of-life-enhancing assets (physical assets). The ToC suggests the importance of asset ownership to improving household well-being by building resilience and capturing opportunities. For instance, productive assets like agricultural land, livestock, farm equipment, and fishing equipment have income-generating potential because they can be used as part of a livelihood or lent out for a fee. On the other hand, quality-of-life-enhancing assets such as lighting, toilets, and home appliances may not directly produce income for households. However, they may increase the household's well-being by reducing time and effort spent on household tasks, providing more time for leisure and other productive activities. According to the ToC, these assets help households build resilience and capture opportunities. Productive assets, in particular, can increase income, diversify income streams, and mitigate risks within livelihood activities. While non-productive assets cannot generate income, they can be liquidated to cope with shocks.

The ToC for asset ownership addresses the gaps in analyzing poverty. Thus, it provides a comprehensive approach to understanding the underlying causes of poverty by focusing on the factors that constrain or enhance livelihood opportunities. Such constraints might spring from the foundational capabilities at the household level or may result from macroeconomic stability, good governance, institutional norms, the existence of government social protection programs, and community asset at the macro level. Hence, the ToC was built on a 'micro–macro' perspective and is more likely to lead to more strategic interventions.

In the context of the study, the ToC was adopted to estimate a model that would explain the effects of asset ownership on the poverty status of households during the pandemic. Based on the assumptions outlined by the ToC, the study came up with three hypotheses: (1) productive asset significantly increased the likelihood of households living above the poverty threshold during the pandemic, (2) physical asset significantly decreased the likelihood of households living above the poverty threshold during the pandemic, and (3) household head characteristics significantly affected the likelihood of households living above the poverty threshold during the pandemic.

Analytical Design

The data collected were treated and analyzed using descriptive statistics. For the model estimation, logistic regression was applied to measure the influence of socio-economic and livelihood asset variables on household poverty status. The general derivation of a binary logistic regression model is as follows (Asterious and Hall 2011):

$$Logit(P_i) = ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \sum_{k=1}^{i} \beta_i X_i + \mu_i \quad \text{(Eq1)}$$

where $ln\left(\frac{P_i}{1-P_i}\right)$ explains the odd ratio of households being nonpoor, β_0 is an intercept of the designated model, β_{ij} represents the slope coefficient of the model, X_i is representative of all the explanatory variables of the model, and μ_i is the error term of the estimated model.

The dependent variable was created by applying the income threshold, the amount needed to meet basic food and non-food needs set by the PSA in 2018. In other words, the total annual expenditures of households covered were converted into binary variables, 1 for nonpoor and 0 for poor.

Principal component analysis (PCA) is used when independent variables display collinearity (Mooi et al. 2018). To mitigate this and avoid biased results, PCA was used to convert a large number of independent variables into a lower number of variables, called principal components, independent of each other. Based on Kaiser–Meyer–Olkin (KMO) statistic, the variables are sufficiently correlated for PCA (80%). An intuitive way to decide on the number of factors is to extract all the factors with an eigenvalue greater than 1. This is called the Kaiser criterion or latent root criterion. However, the Kaiser criterion is well known for over-specifying the number of factors (Russell 2002). In addition, the components are ordered so that the first component (PC1) explains the largest possible amount of variation in the original data. The second

component (PC2), on the other hand, explains additional but less variation than the first component. Therefore, each component captures an additional dimension in the data while explaining smaller and smaller proportions of the variation of the original variables. Hence, for this study, the analysis settled on two principal components.

Principal component analysis was applied to physical assets using the corresponding set of asset indicators. These indicators include wall material, roof material, and ownership of radio, television, washing machine, mobile phone, and stove. A separate PCA was applied to productive assets using a set of asset indicators for financial and natural assets. These assets are refrigerator, motorized boat, motorcycle, fishing equipment, farm equipment, savings account, credit access, agricultural land, large livestock, and small livestock. Factor scores of the first two principal components with eigenvalues greater than one for each asset category were used as independent variables. In addition, household size, household head sex, and squared value of household head age were also used as independent variables. Moreover, diagnostic tests were performed to validate model adequacy, such as the test of independence of observations, multicollinearity test, and specification error test. Regression models estimated were tested for model fit using the likelihood ratio Chi-square statistic, Hosmer-Lemeshow test, and pseudo-R-square. These calculations in modeling were aided with STATA version 15.1.

RESULTS

Socioeconomic and Demographic Profile

The majority of the fishing households were headed by male household members (88%) and belonged to the age group of 35–54 years (64%), indicating that the majority of the household heads were in their prime working age. In terms of educational attainment, most of them were elementary undergraduates (34%). Only 16% was at least high school graduates. The average household size was five members for nonpoor households and six for poor households.

Asset Ownership

The fishing households reported ownership of physical and productive assets. For instance, they reported ownership of some basic consumer durables like mobile phones (87%), television (72%), radio (37%), gas stove (24%), and washing machines (23%) (Table 2). Most of them had housing made of strong materials for walls (46%) and roofs (72%). In addition, the majority of them owned productive assets like a motorized boat (59%) and fishing equipment (59%). They also had a savings account (54%) and access to credit (61%). Most households also possessed farm equipment (42%) and large livestock (45%). Only a few owned a refrigerator (17%) and a sewing machine (3%) (Table 2).

Poverty Situation

During the pandemic, the fishing households in the study areas recorded around 32% poverty incidence at PHP 20,085 average annual per capita expenditure (PCE) (SD = PHP 2,504, COV=12.5%) (Table 3). On the other hand, nonpoor households who could maintain at least the minimum living standard recorded an average of PHP 28,477 annual PCE (SD = PHP 3,030, COV = 10.6%).

Table 2. Livelihood assets owned by households in Bicol Region, Philippines.

Livelihood Assets Owned	Frequency	Percentage
Physical Assets		
Consumer durables		
Mobile phone	173	87
Television	144	72
Radio	74	37
Stove	47	24
Washing machine	45	23
Housing material (wall)		
Strong materials	91	46
Mixed (predominantly strong materials)	32	16
Mixed (predominantly light materials)	20	10
Light Materials	57	29

Livelihood Assets Owned	**Frequency**	**Percentage**
Housing material (roof)		
Strong materials	144	72
Mixed (predominantly strong materials)	15	8
Mixed (predominantly light materials)	5	3
Light Materials	36	18
Productive Assets		
Credit access	122	61
Motorized boat/banca	117	59
Fishing equipment	117	59
Savings account	107	54
Small livestock	96	48
Large livestock	90	45
Agricultural land	85	43
Farm equipment	83	42
Motorcycle/Tricycle	75	38
Refrigerator	33	17
Sewing machine	5	3

Table 3. Poverty incidence and annual per capita expenditure (PCE) of poor and nonpoor in the study areas.

Province	**Poverty Incidence**	**Poor**	**Nonpoor**
Sorsogon	43%		
Mean annual PCE		23,427.87	31,194.19
Standard Deviation		1,454.09	2,854.89
Coefficient of Variation		6.21	9.15
Camarines Sur	42%		
Mean annual PCE		19,698.90	27,971.61
Standard Deviation		2,585.79	2,554.97
Coefficient of Variation		13.13	9.13
Masbate	26%		
Mean annual PCE		19,770.32	28,428.14
Standard Deviation		2,165.36	3,109.57
Coefficient of Variation		10.95	10.94
Overall	32%		
Mean annual PCE		20,085	28,477
Standard Deviation		2,504	3,030
Coefficient of Variation		12.5	10.6

Model estimation on the influence of asset ownership on poverty situation

The first two components of PCA for physical assets accounted for at least 40% of the total variation (Table 4). For productive assets, the first two components of PCA accounted for at least 50% of the total variation. A closer look at the first two principal components of each livelihood asset is outlined in Table 5. The first component for the physical asset was primarily a measure of roofing material (48%), while the second component was associated with radio ownership (70%). On the other hand, the first component for the productive asset was primarily associated with large livestock ownership (46%). The second component was a measure of access to credit (61%).

The results of binary logistic regression showed that household size was significantly associated with poverty situation (Table 6). Specifically, households with larger family sizes were more likely to be poor. The findings also suggest that the relationship between household head age and poverty was negative and significant for Model 1 and Model 2. In other words, households with older heads have a higher chance of being poor. Meanwhile, household head sex was not statistically significant in all four models.

Table 4. Eigenvalues and the proportion of variation explained by the principal components for physical assets and productive assets in Bicol Region, Philippines.

Component	Eigenvalue	Proportion	Cumulative
Physical Assets			
1	2.0054	0.2507	0.2507
2	1.1955	0.1494	0.4001
3	1.0328	0.1291	0.5292
4	1.0301	0.1288	0.6580
5	0.7703	0.0963	0.7543
6	0.7514	0.0939	0.8482
7	0.6499	0.0812	0.9294
8	0.5646	0.0706	1.0000
Productive Assets			
1	4.0753	0.3705	0.3705
2	1.4681	0.1335	0.5039
3	1.1405	0.1037	0.6076
4	0.9581	0.0871	0.6947
5	0.9106	0.0828	0.7775
6	0.7429	0.0675	0.8450
7	0.4735	0.0430	0.8881
8	0.4423	0.0402	0.9283
9	0.3925	0.0357	0.9640
10	0.2329	0.0212	0.9851
11	0.1634	0.0149	1.0000
Overall KMO		**0.7953**	

Table 5. Principal component analysis results using indicators for physical and productive assets.

Livelihood Asset	Component 1	Component 2
Physical Assets		
Wall material	0.3640	-0.3662
Roof material	0.4839	-0.1758
Radio	0.0880	0.6965
Television	0.4108	0.1358
Washing machine	0.3883	-0.0283
Mobile phone	0.3686	0.4361
Stove	0.3975	-0.0177
Productive Assets		
Refrigerator	0.0605	-0.1247
Motorized boat	-0.0055	-0.2238
Motorcycle	0.0261	0.2876
Fishing equipment	0.3775	-0.0179
Farm equipment	0.4352	-0.1340
Savings account	-0.0331	0.5779
Credit access	0.0397	0.6111
Agricultural land	0.4266	-0.0884
Large livestock	0.4550	-0.0437
Small livestock	0.3096	-0.0047

Table 6. Logistic regression results. Standard error is enclosed with parenthesis; *$P < 0.10$; **$P < 0.05$; ***$P < 0.01$, ns-not significant.

Variable	Model 1	Model 2	Model 3	Model 4
Household size	0.6716*** (0.1035)	0.6791** (0.1120)	0.6283*** (0.0673)	0.6338*** (0.0709)
Household head sex	0.3035^{ns} (0.2287)	0.2834^{ns} (0.2458)	0.8327^{ns} (0.4741)	0.9176^{ns} (0.5710)
Household head age squared	0.9995* (0.0003)	0.9994* (0.0003)	0.9999^{ns} (0.0002)	0.9998^{ns} (0.0002)
Physical Asset	1.2871^{ns} (0.2443)	0.3683*** (0.1146)	1.2010^{ns} (0.1517)	0.4015*** (0.0849)
Productive Asset	9.0586*** (3.4743)	9.2288*** (3.6558)	2.5403*** (0.4407)	2.3608*** (0.4212)

The four models were further tested for model fit upon complying with the assumptions underlying the use of logistic regression (Table 7). The likelihood ratio Chi-square for each model tells us that each model fits significantly better than a model with no predictors. Except for Model 3, the Hosmer-Lemeshow test indicates that the deviation is not statistically significant for all models, which means that the models satisfactorily fit the whole set of observations. On the other hand, the higher pseudo-R-square indicates that the model better predicts the outcome. While pseudo-R-squares cannot be interpreted independently or compared across datasets, they are valid and helpful in evaluating multiple models predicting the same outcome on the same dataset. Hence, based on the pseudoR-squares reported, the results suggest that Model 2 fits the outcome data better than the three models.

Table 7. Overall model fit results. **$P < 0.05$; ***$P < 0.01$, ns-not significant.

Model	Likelihood ratio chi-square test	Goodness-of-Fit (Hosmer-Lemeshow Test)	Pseudo R^2
Model 1	154.57***	6.20^{ns}	0.6164
Model 2	166.17***	6.99 ^{ns}	0.6627
Model 3	60.77***	15.59**	0.2424
Model 4	81.56***	8.86 ^{ns}	0.3253

DISCUSSION

Fishing Households' Socioeconomic and Demographic Profile

Fishing communities often face disadvantages due to demographic and socio-economic marginalization. Previous studies have shown that fisherfolks hardly advance their formal education (Huynh 2021; Macusi et al. 2022). In addition, they often lack functional literacy skills that would help them navigate by satellite, understand microfinance, use digital technologies, diversify their businesses, and deal with official documents (UN 2006). Those with lower educational levels tended to keep fishing as their primary source of livelihood because they only had fishing boats and nets (Blythe et al. 2014). However, when it comes to diversification of sources of income, large family size in fishing communities is often seen as an advantage. Increasing household size means more labor for agriculture activities and greater opportunity to exploit fishery resources (Amevenku et al. 2019).

Asset Ownership

Numerous studies in the literature cited the scant assets owned by fisherfolks. For instance, a study in Malangrapat village in Indonesia revealed that fishing households headed by women possessed a relatively low and unsustainable number of assets (Khodijah 2014). In Bangladesh, the level of different livelihood capitals of floating fishing households was also lower when compared to the national average (Ahmed et al. 2021). In a similar study in the Philippines, ownership of all forms of capital in fishing households around Laguna Lake was also reported at deficient levels (Palanca-Tan 2020). Many financial and insurance service providers in the Philippines are willing to provide their services to small-scale fisheries to increase their access to productive assets. However, financial institutions

struggle with providing credit to small-scale fisheries because of the seasonality of the fishing business, lack of insurance for fishing vessels, and internal lack of technical knowledge about fisheries (Badiola et al. 2021).

The ownership of physical assets of the households allowed them to produce essential services like entertainment, communication, food preparation, and laundry. A basic infrastructure through decent housing was also equally important to execute these productive life tasks. As input to household production, benefits associated with ownership of consumer durables included the reduced time required for household chores and increased participation of women household members in economic activities (Garone et al. 2019).

Meanwhile, productive assets are vital for producing food, generating income, accessing loans, and other opportunities (Winters et al. 2009). They serve as a buffer against shocks, such as the COVID-19 pandemic (Ferrer et al. 2021) and adverse weather conditions that threaten food production and supply (Johnson et al. 2016). For a fishing household, fishing equipment serves as the principal livelihood asset (Huynh 2021).

Poverty Situation

Fishing households can initially be above the poverty line. However, because of their vulnerable condition, they face the risk of instantly falling below the poverty threshold when shocks arise (Preña and Labayo 2022). The outbreak of COVID-19 has upended efforts to reduce poverty worldwide. As the UN (2021) noted, COVID-19 has devastating impacts on specific goals and targets, threatening decades of development gains. In 2030, the UN (2021) projects the global poverty rate at seven percent, therefore, missing the target of eradicating poverty. In 2020, an additional 119-124 million people were pushed back into extreme poverty due to COVID-19. In the Philippines, fisherfolks lament limited financial assistance and logistical constraints. According to the personal experiences shared by fisherfolks, the quarantine measures prevented them from going out and fishing which compromised their livelihoods and income (Preña and Labayo 2022).

Model estimation on the influence of asset ownership on poverty situation

Results presented that households with more dependents had more chance of being poor as there would be less expenditure on things like education and healthcare to meet basic food needs for survival (Wang et al. 2021). On a positive note, increasing household size can be associated with more diversified income. For instance, Abdulai and CroleRees (2001) argued that a larger household size means more labor supply, increasing the alternative sources of income for the household. Within the context of fishing households, this would imply more diversified sources of income in both fishery and agriculture (Asravor 2017). However, because of the larger household size, income earned from multiple income sources would mean a smaller share of the output that is marketed (Minot et al. 2006).

Household head sex was found to be not associated with the poverty condition of the fishing households. However, results from the literature indicated a significant relationship between household head sex and income diversification. Previous studies have shown that income diversification has a positive influence on income. Consequently, households with less diversified income tend to be poor (Kidane and Zegeye 2019).

Concerning household head sex, Hesselberg and Yaro (2006) concluded that female household heads are more diversified due to involvement in various income-generating activities. This was consistent with the study of Asravor (2017), wherein male household heads were less diversified in all their activities especially concerning income-generating activities. Empirical evidence shows that the life cycle affects asset accumulation, particularly in the productive age group (Mukuka et al. 2017). According to Majeed et al. (2015), the probability of being poor rises up to the age of 42 and then declines. A possible reason could be the accumulation of assets in old age.

Households with a low non-labor asset base tend to be poor (Etuk et al. 2015). Based on PCA, large livestock ownership was moderately correlated with the first component, while credit access was strongly correlated with the second component. Hence, productive asset, in this case, was primarily a measure of large livestock ownership and credit access. It should follow that households above the poverty threshold tend to own more productive assets. Whereas, households below the poverty threshold tend to own less productive assets. This discrepancy can be primarily attributed to the income disparity of households and variations in their access to resources, including credit, education, and networking opportunities (Knudsen 2016). This hypothesis was confirmed based on the logistic regression results. Households that owned productive assets during the pandemic were less likely to experience poverty. In other words, owning more income-generating assets, like livestock and access to credit, puts a household at greater odds of living above the poverty threshold than households that own less or have less access.

Previous studies had shown that productive asset grants were an effective tool in pushing poor households out of poverty. For instance, Edmonds and Theoharides (2019) observed improvements in the material well-being of the beneficiaries because of an asset transfer program in the Philippines. In a similar study in Malaysia, Azima et al. (2018) concluded that coastal fishermen were poor because of the lack of access to productive assets.

On the other hand, the physical asset was significantly and negatively associated with poverty for Model 2 and Model 4. The PCA suggests that roofing material was moderately correlated with the first component, while radio ownership was strongly correlated with the second component. Since physical assets refer to non-income generating but nonetheless enhance the quality of life, it follows that households that own productive assets have less ability to alleviate the effects of the pandemic. Based on the logistic regression, the results suggest that physical asset increases the odds of households experiencing poverty.

Given the few assets of fishing-dependent households, many households lacked viable ways and were unprepared to cushion the impact of the pandemic. In Southeast Asia, this represents more than 50 percent of the fisheries sector composed of small-scale fishers (Kaewnuratchadasorn et al. 2020). In the Philippines, short-term emergency support was provided to vulnerable families including in the fishing communities, through the SAP. Financial assistance has been helpful, especially in addressing immediate challenges related to consumption. However, the small-scale fishers had to fend for themselves for months right after implementing quarantine measures. According to the fisherfolks, government support for the fishers came later in 2020. As an adoptive response, fishers engaged in direct fish marketing and online selling. Similar cases were documented in other countries in Southeast Asia (Ferrer et al. 2021).

Poverty among fishing households in the Bicol Region can be considered an outcome of a lack of productive assets. Due to their restricted access to these assets, households face limitations in their ability to consistently generate income. Socioeconomic characteristics like household size and household head age also affect the poverty status of households when shocks arise. A larger family typically entails a higher demand for resources and necessities. Meanwhile, older household heads may encounter challenges when it comes to prolonged engagement in physically demanding fishing activities. This can significantly affect the household's capacity to generate income, especially when fishing serves as their primary livelihood. Households with larger family sizes and older household heads tend to fall into poverty. Thus, livelihood intervention programs should prioritize improving access to productive assets of fishing households with larger household sizes and old-age household heads to help them build resilience against current and future risks and capture opportunities. In addition, the provision of productive assets should be complemented with capacity-building services like training, mentoring, and providing market links.

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ETHICAL CONSIDERATIONS

Sensitivity and courtesy were observed during the whole process of the interviews. Respondents were given informed consent, emphasizing the anonymity and confidentiality of their responses. It was made clear that their participation was entirely voluntary and that their information would be kept confidential and anonymous.

DECLARATION OF COMPETING INTEREST

The authors declare that there is no competing interest to any authors.

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